INFORMATION PROCESSING
IN
HIGH AND LOW REDUNDANCY SCHIZOPHRENICS

by

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A B S T R A C T

Cromwell's (1968, 1972, 1975) stimulus redundancy theory was tested on two levels: firstly, by examining the process-reactive and paranoid-nonparanoid dimensions which form the basis of identification of high and low redundancy schizophrenics; and secondly, by examining two predictions of the theory pertaining to the information processing characteristics of high and low redundancy schizophrenics.

In the first part of the study, three schizophrenic groups (acute, chronic and remitted), nonschizophrenic psychiatric patients and normals were assessed on material relevant to ascertaining the basis of subdivisions such as the process-reactive dimension. It was concluded that process-reactive ratings were largely measures of extrinsic factors, such as social competence, and were of some practical use in assessments of prognosis. However, there was little basis upon which to conclude that such subdivisions of schizophrenic samples would result in the identification of groups of patients who would differ fundamentally in their cognitive functioning.

In the second part of the study, two predictions of Cromwell's stimulus redundancy theory were examined: rate of processing and extensity of attention. The performance of high and low redundancy schizophrenics, nonschizophrenic psychiatric control patients and normal controls was assessed on three information processing tasks. The results offered no positive evidence for Cromwell's theory: low redundancy schizophrenics were not found to process information faster, or to have a broadened attentional field as compared to high redundancy schizophrenics. It was concluded that a more fruitful direction for future research may lie in investigations of the strategies of processing used by schizophrenic patients.

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"It seemed of little value to review the literature completely, since this would be almost impossible in view of the fact that practically the entire psychiatric literature would have to be included; to some extent, almost every systematic work on psychiatry has touched upon what we have come to consider the dementia praecox question. Only the more recent publications are of some value; many of these are interesting only inasmuch they reveal how erroneously an excellent concept can be misunderstood".

Bleuler (1911, p.2)

"The literature on schizophrenia is a voluminous one, the size of which is in part determined by the multiplicity of the contradictions. There is a marvellous value in this since one can, on an ad hoc basis, claim that virtually anything has been demonstrated and be correct".

Cancro et al (1971, p.352)

CHAPTER 1 - AIM OF THE STUDY

In this study an attempt was made to investigate and unite two prominent but disparate areas in the field of schizophrenia research. Firstly, the nature of classificatory dimensions such as process-reactive, paranoid-nonparanoid and acute-chronic, as part of the continuing search for meaningful subgroups of schizophrenics beyond the Kraepelinian symptom clusters which constitute traditional categorizations; the second area is that of cognitive functioning in schizophrenics. Although the notion of a single performance deficit common to all schizophrenics has received little support, it does seem likely that one of a probable number of such deficits is evident in the broad fields of attention and perception. Since the early 1970's there has been a growing trend to employ the information processing paradigm in investigations of cognitive functioning in schizophrenics.

Cognitive studies in general show that dichotomization of the schizophrenic group results in findings which can be interpreted to indicate that, within the spectrum of schizophrenias, there may be subgroups of patients having different attentional or perceptual styles, strategies and/or deficits. No definitive position has been reached regarding either the nature of the subgroups, the exact nature of the deficits or the possible relationships between them. In a series of publications, Cromwell (1968, 1972, 1975) integrated a number of loose formulations and put forward a theoretical model relating the process-reactive dimension to information processing deficits.

Borrowing from Pribram & Melges' formulation (1969), Cromwell based his theory on a concept of "stimulus redundancy", which he used to refer to the amount and rate of stimulation being received and processed by the individual. "Simply stated, individuals are not disposed to process all the information which the environment offers them. Those who 'block out' input extensively are referred to as 'high redundancy' individuals. Their behaviour tends to produce a

'sameness' in the environmental conditions they experience. Those who 'reach out' for unusually high amounts of input are referred to as 'low redundancy' individuals. Sometimes their rapid pace of responding to input goes beyond their ability cognitively to organize it all" (1972, p.137). Importantly, Cromwell linked his divisions to the process-reactive and paranoid-nonparanoid dimensions of schizophrenia, which have, of late, received a great deal of attention; he did not, however, articulate the exact nature of the relationship between his proposed groupings and the latter two dimensions. Also, although he stated his theory in terms of information processing, he conceded that "the relationship of the redundancy formulation to information processing needs further clarification" (1968, p.369).

There do not appear to have been any reported attempts to directly test Cromwell's propositions regarding the relationship between process-reactive subclassification and input processing styles. The aim of this study was to try to test this theory directly by first examining the nature of the process-reactive dimension and then attempting to relate it to performance on information processing tasks.

For the sake of clarity the report of this study is divided into three sections. In Section One a general introduction to the scope and terms of the study will be given. Section Two deals with the investigation into the nature and usefulness of the process-reactive and paranoid-nonparanoid dimensions. Section Three covers the investigation into some of the information processing characteristics of these subgroups of schizophrenics.

S E C T I O N O N E

CHAPTER 2 - ASSUMPTIONS OF THE STUDY

2.1 HOMOGENEITY VERSUS HETEROGENEITY IN SCHIZOPHRENIA

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SECTION ONE

CHAPTER 2 - ASSUMPTIONS OF THE STUDY

Any attempt to clarify thinking about, and to research, the cognitive functioning of two groups of schizophrenics within a particular paradigm, that of information processing, would need to begin by examining two basic assumptions:

- Firstly, that it is more useful to think of schizophrenia as a heterogeneous group of disorders than to consider the disorder to be unitary in its individual manifestations, and

- Secondly, that it is valid to assume that deficits or dysfunctions in cognitive behaviour are central to the disorder, schizophrenia, and further, that information processing offers an appropriate methodology for examining these dysfunctions.

These two assumptions will be examined separately as a general introduction to the body of the thesis.

2.1 HOMOGENEITY VERSUS HETEROGENEITY IN SCHIZOPHRENIA

The controversy surrounding the unitary nature, or otherwise, of schizophrenia can be articulated from three different perspectives:

- The historical development of the concept of schizophrenia
- The traditional diagnostic subtypes
- The empirical search for the single characterizing deficit

2.1.1 The Historical Development of the Concept of Schizophrenia

In 1896 Kraepelin introduced the distinction between dementia praecox and manic-depressive insanity; he did so on the basis of a presumed predictable deterioration in the former, despite his own observations to the contrary (Kendell, 1972; Ollerenshaw, 1973; Rieder, 1974). In so doing he created the basis for a

unitary notion of schizophrenia, predicated upon poor prognosis and assuming a one-to-one relationship between symptomatology, pathology, aetiology and prognosis. Bleuler (1911) appeared to differ from Kraepelin in his thinking about schizophrenia in two respects: firstly, he introduced the notion of a group of schizophrenias, as opposed to a single entity; and secondly, he rejected the notion of poor prognosis or deteriorating course as a criterion essential to the concept of schizophrenia. It is asserted that Bleuler appeared to differ because, on closer examination, it becomes clear that Bleuler did not fundamentally clarify the Kraepelinian dilemmas. Although he addressed himself to "the group of schizophrenias", in his subsequent analysis of symptomatology and the nature of the disease, he continually refers to only one disorder. In fact, he asserted that "thorough study of the psychopathology revealed everywhere the same fundamental phenomena", and that, "subdivision of the group of schizophrenias is a task for the future" (p.280). It is similarly clear that, although Bleuler rejected the notion of deterioration, his reasoning could not go beyond it, mainly because he clung to the notion of an organic defect. Accepting, as he did, that the illness could improve, he either had to postulate that the organic defect came and went, or he had to argue that it was always latently present and could be precipitated. He chose the latter, thus arguing that the symptoms corresponded to the defect and that this defect was continually present. By implication then, poor prognosis, or continual disorder via latency, remained with schizophrenia (Rieder, 1974). In Bleuler's words " ... as yet I have never released a schizophrenic in whom I could not still see distinct signs of the disease ... we never found complete restitution" (1911, p.256).

In this way, both Kraepelin, and inadvertently, Bleuler, propagated the tautological argument that those patients who were diagnosed as suffering from dementia praecox and later recovered could not have actually had dementia praecox in the first place (Shean, 1978). It is clear that new entities have been catalogued in a bid to preserve a concept of schizophrenia as a unitary and

deteriorating syndrome. Symptomatologically similar syndromes leading to recovery have been variously relabelled as "Schizo-affective states", "Schizophreniform states", "Schizoform states", "oneiraphrenias", "benign stupors", "non-praecox catatonias", and many others (Sullivan, 1924; Bellinger, 1932; Vaillant, 1964; Kind, 1966; Krapf, 1969).

It has been argued that, from an historical perspective, the concept of schizophrenia as homogeneous was based largely on the notion of poor prognosis. In addition to the obviously fallacious assertion inherent in arguing that similar outcomes must result from similar processes (Strauss & Carpenter, 1972), other lines of evidence contradict the proposal that schizophrenia is a unitary disorder because it is followed by a uniformly poor prognosis:

- Follow-up studies of schizophrenics do not confirm uniformly poor prognosis, even in the Scandinavian countries where poor prognosis is adhered to as a fundamental criterion of the diagnosis (Rieder, 1974; Cromwell, 1975). Estimates of recovery in random American and European samples vary from 15 - 40% (Blair, 1940; Simon & Wirt, 1961; Bleuler, 1974; Forrest, 1975; Hogarty, 1977; Holland & Shakhmatora-Palora, 1977; Zubin & Spring, 1977). In addition, the two-year follow-up of the majority of schizophrenics included in the World Health Organization's International Pilot Study of Schizophrenia showed marked variations of course and outcome, even with clearly specified diagnostic criteria (Sartorius, Jablensky & Shapiro, 1977). The outcome in schizophrenia can range from severe dysfunction to no dysfunction (Strauss & Carpenter, 1972, 1978).

- Bleuler asserted that "as yet we have not discovered any correlation between the initial disease symptoms and the severity of the outcome of the illness" (1911, p.261). That is, the uniform outcome cannot be linked to a uniform presentation, so there is no means of diagnosing schizophrenia, seen as a poor prognosis disorder, on presenting symptomatology. Although some

studies have found a relationship between Schneider's First Rank symptoms and a downhill course (Taylor, 1972), the majority of studies have not been able to establish such a correspondence between characteristic symptoms and outcome (Carpenter, Strauss & Muleh, 1973; Carpenter & Strauss, 1974; Hawk, Carpenter & Strauss, 1975; Durell & Katz, 1977; Strauss & Carpenter, 1978).

- The anticipation of negative symptomatic outcome in schizophrenia has been sharply challenged, particularly in regard to relatively young, acute schizophrenics. There is recent evidence suggesting relatively small differences in functioning between schizophrenics and nonschizophrenics some years after hospitalization (Strauss & Carpenter, 1972; Harrow & Silverstein, 1977).

- The "poor prognosis" view of schizophrenia has remained popular amongst certain writers in Europe (for example, Astrup & Noreik, 1966; Langfeldt, 1969), Britain (for example, Forrest & Hay, 1973) and in America (for example, Feighner et al, 1972). There have been attempts to claim that poor prognosis schizophrenia is "true" or "nuclear" schizophrenia (Fish, 1966). However, it is clear when the diagnostic criteria used in these approaches are examined, that many known poor prognostic factors are incorporated into the diagnosis, for example, single marital status, poor premorbid social or work adjustment, insidious onset, etc. It is therefore not surprising that poor prognosis appears to be a prominent feature of the disorder (Carpenter, Strauss & Bartko, 1974; Carpenter, 1976).

Fish (1966) pointed out that there were two ways out of the Kraepelinian dilemma: either one could regard schizophrenic-like disorders which recover as a separate group of psychoses and apply the term schizophrenia only to those non-organic disorders which do not recover, or one could establish diagnostic criteria for schizophrenia other than the course of the illness. As it seems clear that "recovery alone is neither a sufficient nor a necessary condition for classifying as complex a group of disorders as the

so-called schizophrenias" (Cancro & Pruyser, 1970, p.67), it becomes necessary to abandon attempts to uphold the unitary nature of schizophrenia on the basis of prognosis (Strauss & Carpenter, 1972).

2.1.2 The Traditional Diagnostic Subtypes

Once Kraepelin had laid the foundations for his classification by separating manic-depressive insanity from dementia praecox, his way of dealing with the symptomatic heterogeneity of the latter was to establish the basis for the eleven symptom clusters which now comprise the psychiatric nomenclature for schizophrenia. Despite differential symptom emphasis in the past, the major symptoms of schizophrenia have been found to be relatively well-agreed upon in cross-national studies (Gurland et al, 1970; Astrachan et al, 1972; Kendell, 1972). This agreement does not extend however, to the subtypes, generated as they were to bind the heterogeneous group of disorders together under the single concept of schizophrenia. A number of criticisms can be levelled at symptomatic division according to the Kraepelinian tradition:

- The reliability of subtype diagnosis has been shown to vary between 28 and 87% (Zubin, 1967, in Salzinger, 1973).

- Evidence of the validity of these subtypes with regard to aetiology, treatment and prognosis is lacking (Zubin, 1961, in Salzinger, 1973; Durell & Katz, 1977).

- The subtypes are really little more than loosely descriptive and it is clear that patients often evidence symptoms of more than one category; in addition to which the clinical pictures of many individuals change from one subtype to another within a relatively brief time (Shean, 1978).

- Unspecified factors have resulted in the disuse of some subtypes in recent years (Durell & Katz, 1977). For example, London (1968, in Shean, 1978) has reported that not one case of catatonic or hebephrenic schizophrenia appeared in the first

admission records of one large mental hospital during a period of 5 years. Paranoid, chronic undifferentiated and simple, in that order, are the most commonly recorded subtype diagnoses (Salzinger, 1973).

- The evident lack of success of attempts to relate variable schizophrenic functioning to the diagnostic subtypes have indicated serious limitations in the system (Herron, 1962; Buss & Lang, 1965; Lang & Buss,1965; Yates, 1966).

It is clear then, that traditional classification systems, based rather on prior principles than systematic studies, have little clinical or research utility (Robins & Guze, 1970).

Given that the diagnosis of schizophrenia is a "descriptive and phenomenological classification not rooted in a deeper understanding of aetiology or pathogenesis" (Grumet, 1969, p.457), arguments as to which diagnosis is correct become meaningless. Without an ultimate criterion to appeal to, only syndromes, and not illnesses or diseases, can be considered; usefulness, rather than correctness is the only criterion for advocating one set of diagnostic criteria rather than another (Klein & Davis, 1969; Kendell et al, 1971; Kendell, 1972).

If we accept that similarity in symptoms allows for aetiological and prognostic diversity (Krapf, 1969), and if we accept that the term "schizophrenia" denotes a behavioural construct (Cromwell & Dokecki, 1968), then a classification system is best based on manifest psychopathology, catalogued as signs and symptoms (Carpenter, 1976). If our conception of schizophrenia derives from this basis, then a broad heterogeneous group has to be considered, subtypes of which can be redefined in terms of other principles, such as prognosis. Such reasoning has founded the broader American and Russian views of schizophrenia, and had led to the development of alternative subtype classification, such as process-reactive, paranoid-nonparanoid and acute-chronic (Garmezy, 1964; Kendell, 1972; Frank, 1975).

2.1.3 The Empirical Search for the Single Characterizing Deficit

The final bastion of attempts to maintain the homogeneity of schizophrenia is clearly seen in searches for the psychological deficit. A typical study performed prior to the mid-1960's would compare a group of schizophrenics with a group of normals on a task thought to assess some aspect of psychological functioning. A typical result would be that schizophrenics performed more poorly and more variably than normals (Shakow, 1963; Buss & Lang, 1965; Lang & Buss, 1965). In fact, the variability of the schizophrenic group was typically the only consistent finding (De Wolfe, 1974; Cromwell, 1975; Houlihan, 1977). The rather indifferent outcome of this research precluded the possibility of explaining schizophrenia in terms of a single kind of performance deficit. It also displaced the assumption of homogeneity underlying such work.

Although Harris (1957) and Silverman (1964, a & b) clearly demonstrated that dichotomising the schizophrenic group in terms of premorbid history or paranoid symptomatology brought about a reduction in the variability of the scores and therefore a greater meaningfulness to the results, it has taken considerable time for their lead to be picked up by researchers in the field. Yates (1966) and Zimet & Fishman (1970), in comprehensive reviews of the literature, continued to point out that schizophrenia could no longer be investigated as a single category. However, there is now substantial support from fields such as physiology, biochemistry, genetics and psychology to support the concept of schizophrenia as one encompassing a heterogeneous group of disorders.

Up to this point, it has been argued that it is not useful to regard schizophrenia as a single entity. That it has been thought of as such has been shown to be the result of the application of prior principles and historical assumptions which can no longer be defended. On the other hand, while there is wide agreement that the dimensions of process-reactive, acute-chronic and paranoid-nonparanoid are useful in reducing variability in research (Cancro & Sugerman, 1968; Zigler & Levine, 1973; among others), there is

confusion as to what these dimensions might mean. That is, it is not clear how they should be thought of in relation to schizophrenia or in relation to the deficits and dysfunctions evident on psychological tasks. As Yates puts it, "There is however, much less agreement concerning the basic subcategories, except that they do not coincide with psychiatric nomenclature" (1966a, p.123).

In Chapter 3 an attempt will be made to review and explore the nature of these dichotomies.

2.2 THE IMPORTANCE OF COGNITIVE FUNCTIONING AND THE INFORMATION PROCESSING APPROACH

Until fairly recently, perceptual and cognitive processes in schizophrenic patients have raised rather limited interest. Instead, it has been the practice to regard schizophrenia primarily as a disorder of emotionality, mood and personality (Hamilton, 1976). Due to Kraepelin's failure to find any major sensory changes in schizophrenic patients using the experimental techniques of Wundt and concentrating on elementary processes such as sensory thresholds (Weckowicz & Blewett, 1959), interest turned towards emotional factors propounded by the "depth psychologies". It is interesting that such a defocusing of attention on these processes should have taken place, for ample evidence of its importance can be found in the writings of, for example, Bleuler. Although Bleuler asserted that a "clear sensorium" was characteristic of schizophrenia, some of his observations of the attentional behaviour of his patients are hauntingly similar to recent theories. For example:

- "The selectivity which normal attention ordinarily exercises among the sensory impressions can be reduced to zero so that almost everything is recorded that reaches the senses. Thus the facilitating as well as the inhibiting properties of attention are equally disturbed" (1911, p.68).

- "Most chronic patients, however, show a normal or even a hypernormal capacity to maintain the span of attention ..." (1911, p.69).

- "We have already mentioned the peculiar capacity of many schizophrenics to register more details than a normal person under identical circumstances" (1911, p.138).

- "The contraction of the visual field has psychic causes" (1911, p.174).

Despite these observations, Bleuler concentrated on disturbances of higher mental processes and on disordered associations, in particular. This emphasis remained and it has only been more recently demonstrated that schizophrenics' poor performance on word association tasks could be due to attentional, rather than associational, abnormalities (Moon et al, 1968; Mefferd et al, 1969).

Freud hinted at the importance of basic disturbances of perception and cognition (Grumet, 1969) and evidence for this was found in psychodynamically-oriented Rorschach studies (for example, Lovinger, 1956). In addition, analyses of biographical writings revealed clear descriptions of perceptual and cognitive difficulties (Chapman, 1966; Ornitz, 1969; Freedman, 1974). Yet it was only with the work of Shakow (1962, 1963, 1969) that serious laboratory investigations of these processes began. Shakow had pointed consistently to the difficulties schizophrenic patients have in selecting relevant stimuli and screening out irrelevant stimuli in complex tasks calling for an organised response.

Many authors have pointed to the role of perceptual and cognitive factors in an understanding of schizophrenia (Davie & Freeman, 1961; Sarvis, 1962; Yates, 1966; Grumet, 1969; Mefferd et al, 1969), but its primacy only became clearly evident in reviews of "psychological deficit" (Buss & Lang, 1965; Lang & Buss, 1965; Zimet & Fishman, 1970). The term "psychological deficit" had been coined by Hunt & Cofer (1944, quoted by Buss & Lang, 1965) to describe the decrement shown by psychiatric patients in general, but schizophrenics in particular, in comparison to normals on various laboratory and intellectual tasks. Weighing up the evidence

supporting such general theories as social censure, sensitivity to affective stimuli, insufficient motivation and regression, Lang & Buss concluded that "interference theory, as a broad explanation of schizophrenic deficit, has clearly been supported by research findings and appears to be the only theory comprehensive enough to account for what is known" (1965, p.97). At that point interference theory was a poorly articulated conglomerate of the work of Shakow and others and held, in general terms, that schizophrenics had difficulty in focusing on relevant stimuli and excluding irrelevant stimuli. By 1977, though, Schwartz stated that "the literature on cognitive deficits among schizophrenics is so extensive and so consistent that most current investigators appear to take the deficit for granted and are now attempting to account for the mechanisms underlying the poor performance" (p.54).

Although theoretical and empirical work on the nature of the mechanisms will be dealt with later in the thesis, it will be useful to briefly describe the three most prominent cognitive deficit theories:

Drive, Arousal or Response Interference Theory - originally proposed by Mednick (1958) and now best represented by the work of Broen (1966, 1968, 1973) and Broen and Storms (1966, 1967). In essence, it is proposed that perception, learning, thinking and verbal behaviours are disorganized, fragmented and impaired by comparison with neurotics or normals because of abnormally high levels of arousal or activation.

Interference Theory - developed out of the work of Shakow and is now most clearly articulated by Payne's theory of overinclusion and defective filtering (1966, Payne et al, 1970) and Mc Ghie & Chapman's emphasis on the effects of distraction on task performance (Mc Ghie, 1966, 1969, 1970, 1972; Mc Ghie & Chapman, 1961; Chapman & Mc Ghie, 1962). As mentioned previously, the theory concentrates on insufficient focusing on relevant aspects of a defined situation and on susceptibility to the influence of task-peripheral or irrelevant stimuli.

Processing Capacity Theory - Drawing heavily on the work of Broadbent (1958, 1971) this approach has been most fully described by Yates (1966a, 1966b) and has as its central assertion that schizophrenics process information at an abnormally slow rate. Cromwell (1968, 1972, 1975) has added to the theory by arguing that abnormal rates of processing, both fast and slow, are characteristic of different groups of schizophrenics.

Not only do the three theories differ as to the presumed level and focus of the perceptual-cognitive deficits, but also in terms of the wider paradigms from which they draw hypotheses. Processing Capacity Theory is phrased in the language of contemporary information processing theory and investigations issuing from it are characterised by the use of methods recognised and developed within the field of information processing. On a pragmatic level, such an approach offers distinct advantages over other strategies. Not only does it avoid the somewhat unwarranted inferential steps involved in concluding basic processes from complex experimental tasks such as proverbs tests, tests of similarities and word identity tasks (Zimet & Fishman, 1970; Marshall, 1973; De Wolfe, 1974), but direct measures of attention and information processing may enable us to specify cognitive abnormalities in terms of functions currently being investigated in normal subjects (Hemsley, 1976).

It is clear then, that perceptual-cognitive disturbances are a valid area of study and that the information processing approach may be an acceptable network into which to place investigations of these systems. However, studies of the cognitive behaviour of schizophrenics may not only be essential to an understanding of the structure of schizophrenia, but also to its development. Given the problem of heterogeneity referred to earlier, the establishment of reliable systems of subclassifying the schizophrenias would appear to be necessary precursors to aetiological studies (Mc Ghie, 1970). Studies of the cognitive functions of schizophrenics may contribute to more relevant and meaningful differentiation into homogeneous groups (Broen, 1968; Salzinger, 1973; Otteson & Holzman, 1976).

It is precisely in this respect that Cromwell's stimulus redundancy theory has merit. By combining subgroup information derived from life history variables and proposals regarding speed of information processing, Cromwell has propounded a theory arguing that adequacy of premorbid adjustment and eventual prognosis are related to styles or strategies of information processing.

In this introduction, a foundation has been laid for the acceptance of the view that schizophrenia can no longer be regarded as a single disorder with unitary properties, and that alternative forms of subclassification have to be sought. Reference was also made to the utility of the information processing approach for investigating the attentional and perceptual difficulties.

S E C T I O N O N E

CHAPTER 3 - THE DIMENSIONS OF SCHIZOPHRENIA

3.1 THE PROCESS-REACTIVE (POOR PREMORBID-GOOD PREMORBID) DIMENSION

3.2 THE PARANOID-NONPARANOID DIMENSION

3.3 THE ACUTE-CHRONIC DIMENSION

3.4 THE RELATIONSHIPS BETWEEN THE THREE DIMENSIONS

SECTION ONE

CHAPTER 3 - THE DIMENSIONS OF SCHIZOPHRENIA

In Chapter 2 the argument advanced was that the term "schizophrenia" may in fact represent a number of diverse and heterogeneous subgroups. This view appears to have arisen from two bases: firstly, dissatisfaction with traditional nosology, and secondly, the behavioural, symptomatic and prognostic heterogeneity evident among schizophrenics. Zigler and Levine (1973) assert that "in response to a growing disillusionment with the value of nosological categories based on symptom manifestation alone, many workers have attempted to deal with the heterogeneity issue in schizophrenia by employing categories which have little to do with the symptoms the patient manifests while classified as schizophrenic" (p.189). The three categories which have established themselves as useful in this way are the process-reactive (poor premorbid-good premorbid), paranoid-nonparanoid, and acute-chronic dimensions (Silverman, 1967; Eisenthal, Harford and Solomon, 1972; Neale & Cromwell, 1972; Strauss, 1973).

3.1 THE PROCESS-REACTIVE (POOR PREMORBID-GOOD PREMORBID) DIMENSION

The inclusion here of alternative terminology is indicative of the conceptual confusion surrounding this dimension. Although full attention will be given to the presumed nature of the distinction in Chapter 4, an attempt will be made here to outline some basic aspects of process-reactive schizophrenia. Such a review must be selective as the literature on the subject is prolific; for example, between 1964 and 1966, 72 articles on process-reactive schizophrenia appeared in the journals (Mc Cabe & Stromgren, 1975).

The origin of the concept can be traced back to Karl Jaspers who, in 1913, formulated the idea of a reactive (as opposed to a process) psychosis. The reactive state was characterized by acute mental trauma, intelligible psychotic content in terms of precipitating

factors, and favourable prognosis (Vaillant, 1964). Bleuler extended the differentiation, in the fourth edition of his text in 1923, by speculating that these forms of schizophrenia may overlap in terms of symptomatology but probably have different causes - process schizophrenia having a chiefly organic aetiology and reactive a psychogenic one. At a later point, the psychological perspective of Sullivan (1924, 1928), and others, led to an emphasis on pre-breakdown social and psychological variables as outcome predictors; these came to be associated with process-reactive schizophrenia, mainly through the work of Zigler and Phillips (1960). In early writings there appeared to have been concurrence on the view that both forms represented aspects of the single disorder of schizophrenia, despite the differential prognostic emphasis. However, Langfeldt, in 1938 and Kant, in the 1940's, relabelled the reactive group as "schizophreniform psychosis" and in so doing introduced a school of thinking which saw the two forms as separate disease entities (Stephens & Astrup, 1963; Astrup & Noreik, 1966). Kantor & Winder (1959, 1961) introduced a novel aspect to the dimension, by extending Sullivan's thinking on malignant and benign schizophrenia, and argued that the severity and therefore the prognostic status of any disturbance could be predicted on the basis of the age at which pathognomic experiences occurred during childhood. They therefore proposed a developmental theory of psychopathology whereby premorbid factors were related to prognosis; such a theory has implications beyond schizophrenia.

By way of a brief historical review, the various meanings of the process-reactive dimension have been introduced: the idea of two forms of schizophrenia, differing in prognosis and in presentation of the disorder; the notion of separate aetiologies; the notion of distinct and different disease entities; the view that premorbid life experiences would affect the presentation and ultimate outcome of an individual case of schizophrenia; and lastly, the theory that all psychopathology could be related to developmental failure and that differential prognosis could be traced to a broader concept of maturity or competence.

However, measurement of the dimension continued, despite its lack of clarification; "At this point empirical discoveries have outstripped theoretical considerations in the measurement of premorbid adjustment in schizophrenia" (Strauss, Klorman & Kokes, 1977, p.202). Measurement can only be meaningfully considered in relation to the views underlying it, and therefore attention will be given to measurement in Chapter 4.

It is useful to note at this point that a by-product of process-reactive research has been the disorderly development of scales to measure the construct - among the measures which have, or are, being employed are: the Elgin Prognostic Scale (Wittman, 1941; Becker, 1956); the Phillips Premorbid Scale (Phillips, 1953); the Kantor Scale (Kantor, Wallner & Winder, 1953); the MMPI Ego Strength Scale (Herron, 1962); the Premorbid Social Competence Scale (Zigler & Phillips, 1962); the Process-Reactive Self-Report Questionnaire (Ullmann & Giovannoni, 1964); Rorschach Scores (Kantor & Herron, 1966); the General Information Questionnaire (De Wolfe, 1968) and marital status (Farina et al, 1962; 1963; Solomon & Zlotowski, 1964; Held & Cromwell, 1968; Bromet, Harrow & Kasl, 1974). These measures have been comprehensively reviewed and evaluated by Kokes, Strauss & Klorman (1977). The disadvantage of this abundance of measures is that, given the theoretical confusion underlying them, it is arguable whether or not one can equate findings when two different instruments have been used (Solomon & Zlotowski, 1964; Watson & Logue, 1969; Procci, 1976; Zigler, Levine & Zigler, 1976).

Although the prognostic significance of the dimension has been inherent in the thinking about schizophrenia almost from the beginning, the theoretical and research utility of it only really became evident after Harris' study of 1957 became known. Initially no differences were found between acute schizophrenics and normals in his size estimation experiment. After dividing the schizophrenic group on the basis of premorbid adjustment, he discovered "something which had never previously occurred in the history of schizophrenia research. The two schizophrenic groups classified in terms of premorbid history fell in opposite directions in size estimation

level from the normal control group. Good premorbid schizophrenics tended to underestimate and poor premorbid schizophrenics tended to overestimate visual stimulus size. Normals did not differ significantly from veridicality" (Cromwell, 1975, p.598). Significant differences between process and reactive schizophrenics have been demonstrated in autonomic nervous system arousal and responsiveness, conceptual functioning, linguistic and associative processes, learning and performance, censure sensitivity, parent perception and family dynamics. On the basis of two comprehensive reviews of the literature, Higgins (1964, 1969) concluded that process-reactive schizophrenia is a "justifiable classificatory principle in as much as it focuses attention on significant parameters not considered in the Kraepelinian system" (p.22). In fact, a large number of authors have asserted that research projects involving schizophrenics as subjects ought to employ this categorization as a matter of course (Garmezy, 1964; Buss & Lang, 1965; Yates, 1966; Rosenbaum, 1968; Cromwell & Dolecki, 1968; Offord & Cross, 1969; Eisenthal, Harford & Solomon, 1972; Strauss, 1973; De Wolfe, 1974; Frank, 1975; Houlihan, 1977).

3.2 THE PARANOID-NONPARANOID DIMENSION

Although a distinction between paranoid and nonparanoid patients is deeply imbedded in thinking about schizophrenia, it is not without problems, both in designation and in terms of its meaning in the wider context of schizophrenia. Many schizophrenics entertain transient delusions during the course of their illness, even though these may be obscured in a welter of other schizophrenic symptoms. In other patients, a highly elaborated system of delusional thinking is the most prominent feature of the illness and may exist in the absence of other schizophrenic symptoms (Mc Ghie, 1970). Designation as paranoid or not is usually based on whether delusions are the primary symptom feature or not. Besides the judgement involved in distinguishing transient from wide-spread and consistent delusions, diagnosis on admission clearly does not allow for changes which may occur during hospitalization. It has been noted that many paranoids tend to become less paranoid over time (Neale & Cromwell, 1972). In addition, studies employing this distinction

have to contend with the fact that "nonparanoid" is a negative designation, a nonspecific grouping of all diagnosed schizophrenics who have not been considered paranoid (Klorman, Strauss & Kokes, 1977). In terms of its classificatory and heuristic value, opinions vary from seeing it as a more important dimension than any of the others (Yates, 1966; Goldstein, 1970), to the view that the inclusion of paranoid patients within the schizophrenic group merely obscures the clinical picture and that they should be regarded as constituting an entirely separate psychotic group (Mc Ghie, 1970).

In studies using this dimension, final staff diagnosis is often used to make the distinction between paranoid and nonparanoid patients (for example, Goldstein, Held & Cromwell, 1968; Eisenthal, Harford & Solomon, 1972; Goldstein & Halperin, 1977). Others employ rating scales to assess specific symptoms at the time of testing - the prominence of delusions and the clearly secondary appearance of other schizophrenic behaviours (for example, the Venables & O'Connor Scale, 1959). Still others base their diagnoses on clusters of personality traits such as hostility, grandiosity, suspiciousness, minimal guilt, minimal depression and minimal motor retardation (Silverman, 1967). Obviously, these different methods of assigning patients to one group rather than another would not necessarily result in comparable samples, and this presents a problem for research based on this differentiation.

However the importance of separating paranoid from nonparanoid patients cannot be underestimated. Silverman's (1964) study of size estimation levels in paranoids and nonparanoid patients showed that these two groups, like groups separated on the basis of premorbidity, also differed in size estimation levels. Mc Ghie (1970) reviewed the experimental studies in the field of attention and found much support for the paranoid-nonparanoid dichotomy. In general, patients with a predominantly paranoid symptomatology are thought to demonstrate a highly selective type of attention which enables them to screen out extraneous stimulation more efficiently than normals. On attentional tasks, with groups subdivided along drug-nondrug, process-reactive and paranoid-nonparanoid dimensions,

it is the latter which has sometimes been found to relate more strongly to performance (for example, Postman, 1974).

Lastly, the distinction between paranoid and nonparanoid patients also appears to relate to prognosis and course of the illness. For example, paranoid patients have been found to have a later age of onset and fewer and shorter admissions to hospital (Tsuang et al, 1974; Beck, 1978). In a review of the dimension, the conclusion was drawn that paranoid patients are less impaired and have a better prognosis than nonparanoid patients (Houlihan, 1977). These findings prompt questions about the relationship between the process-reactive and paranoid-nonparanoid categorizations, which will be dealt with at the end of this chapter.

3.3 THE ACUTE-CHRONIC DIMENSION

In formal psychiatric classification, an acute-chronic designation has symptomatology as its primary referent; however, this is not the way in which it is used in research on schizophrenics aimed at subgroup clarification (Neale & Cromwell, 1972; Shean, 1978). In this sense it is a time-linked metric referring to either, length of time elapsed since the onset of schizophrenia, that is length of illness; or, to the total length of hospitalization since onset. In both cases onset is defined as the time of first admission, which is an empirically useful but far from ideal criterion, as the date of admission to hospital need not necessarily have any relationship to the time of episode onset (Strauss, 1973; Zubin & Spring, 1977). A further problem with this criterion is that it is claimed that duration of hospitalization is affected by many variables not connected with the schizophrenic process; for example, treatment philosophies of the hospital staff, the adequacy of community supports for the patient and the patient's initial employment competence (Turner & Zabo, 1968; Strauss & Carpenter, 1972). Despite these problems, since Brown (1960, quoted by Mc Ghie, 1970) showed that schizophrenics have a significantly poorer likelihood of improvement after a continuous stay in hospital of 2 years or more, most recent workers have adopted the 2-year hospitalization period as a convenient, though arbitrary, method of denoting the onset of

chronicity. It can be asserted, though, that the issue of chronicity cannot be settled by such time limits (Holzman, 1970), and that a time limit ignores the possibility of a recurrence of an acute reaction after a period of chronicity (Epstein & Coleman, 1970).

However, in general, studies using perceptual and cognitive measures suggest that chronic subjects use fewer cues and focus attention more narrowly than do acutes (Venables, 1964; Strauss, 1973). A possible explanation of this difference is that the narrowing of attention is a reaction to the impoverished, redundant environment of the hospital to which chronics are exposed for long periods of time. Studies of other forms of institutionalization such as imprisonment, indicate that such perceptual styles are not intrinsic to psychosis (Silverman, Berg & Kantor, 1965; Goldstein & Halperin, 1977). The changes wrought by institutionalization are extremely difficult to distinguish from changes which may be an inherent part of the disease process (Mc Ghie, 1970).

In conclusion, it is interesting to note Bleuler's comments on the relationship between acute and chronic states: "The course of the disease is frequently interrupted by acute syndromes, transitory states of various kinds ... in similar fashion, most of the acute syndromes may simply be intensifications of the chronic states" (1911, p.206). For the reasons given, the acute-chronic dichotomy might have minimal utility for experimental psychopathology.

3.4 THE RELATIONSHIPS BETWEEN THE THREE DIMENSIONS

There is a great deal of controversy surrounding the independence or otherwise of these dimensions of schizophrenia; the most simply stated of the relationships are those between chronicity and the other two dimensions:

- Acute-chronic in relation to paranoid-nonparanoid: there appears to be agreement on the observation that paranoid symptomatology is associated with symptomatologically acute patients and that paranoid patients are found less often in chronic groups of schizophrenics (Strauss, 1973; Beck, 1978).

- Acute-chronic in relation to process-reactive: behavioural measures which give results that show the performance level of normals to be better than that of reactives, who are, in turn, better than process schizophrenics, raise the issue of whether or not process-reactive schizophrenia is not simply a measure of either severity and/or chronicity (Neale & Cromwell, 1972). Kantor, Wallner & Winder (1953) had raised the idea of chronicity as being fundamental to the process-reactive dimension by referring to the process type as "true or chronic" and the reactive variety as "benign or acute". Such an hypothesis received confirmation from a number of sources. For example, in a study of possible brain damage in process-reactive schizophrenics, differences between process and reactive patients disappeared when they were equated for length of hospitalization. Similarly, De Wolfe (1968) found that 6 judges rated 60 patients as process or reactive in a manner which demonstrated a significant relationship to total time hospitalised. Nameche, Waring & Ricks (1964) found that 75% of chronic patients were rated as being of the process type or having poor premorbid adjustment. Lastly, Davis, Dizonne & De Wolfe (1971) found that the longer the hospitalization, the lower the I.Q. of the patient, and they argued that this would affect ultimate process-reactive designation.

It appears therefore that neither the paranoid-nonparanoid nor the process-reactive dimension have been shown to be independent of an acute-chronic classification.

- Process-reactive in relation to paranoid-nonparanoid: findings relevant to this relationship have been exceedingly contradictory. A number of studies have found that paranoid patients were more likely to be classified as reactive (for example, Sanes & Zigler, 1971) whereas other studies have not confirmed this relationship (for example, Eisenthal, Harford & Solomon, 1972). In addition, it has been asserted that this positive relationship between good premorbid status and paranoid symptomatology is more evident among acute patients (Zigler, Levine & Zigler, 1977). On the other hand, it has been claimed that reactive patients are likely to be paranoid or nonparanoid with equal frequency, whereas process

patients are most likely to be nonparanoid (Held & Cromwell, 1968; Goldstein, Held & Cromwell, 1968; Goldstein, 1970; Mc Creary, 1974). One of the problems with any attempts to unravel the nature of the association between paranoid status and premorbid adjustment is the heterogeneity of both the nonparanoid group and the good premorbid adjustment (or reactive) group. Another problem is the relationship that both dimensions have with other variables; for example, both paranoid and reactive patients have been found to be less impaired and have a better prognosis than process or nonparanoid patients (Houlihan, 1977), and a greater proportion of reactive and paranoid patients are reported to be married.

As there is no clear evidence that the dimensions are independent of one another, it has been proposed that both should be employed in studies of schizophrenics (Eisenthal, Harford & Solomon, 1972).

Alternative forms of subclassifying the schizophrenic group were introduced in this chapter. It was concluded that the process-reactive and paranoid-nonparanoid dimensions were probably more useful ways of differentiating schizophrenics in research than the acute-chronic dimension. It also became clear that the independence of the dimensions had not yet been established, and that the exact relationship between them required exploration.

S E C T I O N T W O

CHAPTER 4 - THE PROCESS-REACTIVE DIMENSION

4.1 THE RELATIONSHIP BETWEEN THE PROCESS-REACTIVE DIMENSION, THE GOOD-POOR PREMORBID DIMENSION AND PROGNOSIS

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4.3 THE MEASUREMENT OF THE PROCESS-REACTIVE DIMENSION

SECTION TWO

CHAPTER 4 - THE PROCESS-REACTIVE DIMENSION

4.1 THE RELATIONSHIP BETWEEN THE PROCESS-REACTIVE DIMENSION, THE GOOD-POOR PREMORBID DIMENSION AND PROGNOSIS

The first issue to be resolved is the nature of the relationship between the process-reactive dimension and that of good and poor premorbidity; the latter being a dimension which often appears to be used to denote similar features. Bromet, Harrow & Kasl (1974) suggested that the two dimensions had different emphases: the process-reactive dimension, originally operationalized by Kantor, Wallner & Winder (1953), emphasised the development and course of the schizophrenic process itself; whereas the notion of premorbid adjustment, originally operationalized by Phillips (1953), leans more towards a developmental theory of psychopathology, in which the schizophrenic disorder is understood as the consequence of failure to cope with developmental tasks. Although this difference in emphasis is stateable, many clinicians and researchers use the two sets of terms interchangeably (for example, Johannsen, 1964; Zigler & Levine, 1973; De Wolfe, 1974). As these conceptualizations are frequently said to be based on different underlying theoretical assumptions, which will be discussed later in the chapter, they may refer to different things, such as, different outcome groups, symptom types, symptom onset characteristics, premorbid function levels or any combination of these (Strauss, Klorman & Kokes, 1977). However, despite these differences in conceptualization, the actual operations used to classify patients according to these dimensions are very similar, and often identical (Bromet, Harrow & Kasl, 1974). It can be argued moreover, that both dimensions are justified by their relationship to prognosis (Harrow, Tucker & Bromet, 1969) and might therefore be regarded as identical. For example, Mc Creary (1974) states that the importance of the good-poor premorbid distinction lies in its degree of correlation with recovery of

functioning, while both Nameche, Waring & Ricks (1964) and Chapman, Day & Burstein (1961) assert that the process-reactive dimension is based on potential for recovery.

It therefore becomes necessary to examine the factors associated with good prognosis and compare them with the characteristics thought to be consistent with process-reactive, and good- and poor-premorbid schizophrenia.

Bellack (1958) summarised the literature on prognostic factors, and concluded that good prognostic signs were: sudden onset; catatonic symptoms; presence of confusion; duration of illness less than 1 year; higher average intelligence; relief of symptoms following an injection of sodium amytal, and conspicuous precipitating factors. Poor prognostic signs were: a schizoid prepsychotic personality; onset during adolescence or after the age of forty; previous psychotic episodes; duration of present psychosis more than 1 year, and a family history of psychosis or neurosis.

Vaillant (1962, 1963, 1964) collated the findings on prognostic factors up to that point and prepared a table to clarify the results, a modified form of which appears overleaf (Table 1).

Vaillant (1962) added two additional prognostic factors to this list: concern with dying during the acute period as a positive prognostic sign; and a negative prognostic sign if any member of the patient's family had been diagnosed as schizophrenic. Given that the former can be broadly seen to be part of affective symptomatology, and that subsequent research has pointed to the prognostic significance of marriage (Sartorius et al, 1978), then marked agreement can be shown to have been reached on the prognostic factors given in Table 2.

TABLE 1 - POSITIVE CORRELATIONS BETWEEN CERTAIN FACTORS ON ADMISSION AND RECOVERY IN SCHIZOPHRENIA

Authors	Symptoms of Psychotic Depression	Psychotic Depression Heredity	Absence of Schizoid Personality	Acute Onset	Confusion	Precipitating Cause
Hoch (1921)	Yes	Yes	-	Yes	Yes	Yes
Strecker & Wiley (1927)	-	-	No	Yes	No	Yes
Lewis (1931)	No	Yes	No	-	Yes	Yes
Hunt & Appel (1936)	Yes	-	No	-	Yes	Yes
Malamud & Render (1939)	-	-	Yes	Yes	No	Yes
Langfeldt (1939)	Yes	Yes	Yes	Yes	Yes	-
Rennie (1941)	Yes	Yes	No	Yes	Yes	No
Wittman (1941)	Yes	-	Yes	Yes	-	Yes
Kant (1941)	Yes	Yes	Yes	Yes	Yes	Yes
Carter (1942)	Yes	-	Yes	Yes	Yes	Yes
Greenblatt et al (1950)	Yes	-	Yes	Yes	No	Yes
Bleuler (1950)	-	-	Yes	Yes	No	No
Schofield et al (1954)	Yes	-	Yes	Yes	Yes	No
Masterson (1956)	No	-	Yes	Yes	Yes	No
Holmboe & Astrup (1957)	Yes	-	No	Yes	Yes	No

TABLE 2 - A SUMMARY OF PROGNOSTIC SIGNS FOR SCHIZOPHRENIA

	Good Prognosis
1.	Heredity positive for affective disorder
2.	Adequate prepsychotic personality
3.	Acute onset
4.	Precipitating factors
5.	Affective symptomatology
6.	Confusion on admission
7.	Marriage
	Poor Prognosis
1.	Heredity positive for schizophrenia
2.	Schizoid prepsychotic personality
3.	Insidious onset
4.	Lack of significant precipitating factors
5.	Blunted affect
6.	Clear sensorium on admission
7.	Single

(Eitinger et al, 1958; Herron, 1962; Nameche et al, 1964; Astrup et al, 1966; Stephens et al, 1966; Mc Cabe et al, 1971; Vaillant, 1978; Sartorius et al, 1978).

If one examines the characteristics thought to be typical of process-reactive schizophrenia, it is clear that there is a high degree of similarity to schizophrenics thought to have good and poor prognostic signs. A summary of descriptions given of process and reactive schizophrenics is shown in Table 3 overleaf.

TABLE 3 - A SUMMARY OF DESCRIPTIONS OF PROCESS AND REACTIVE SCHIZOPHRENIA

Author	Process	Reactive
Jaspers (1913)		Acute Psychotic content intelligible in terms of a precipitating cause Recovery likely
Herron (1962)	Long term progressive deterioration Little chance of recovery	Adequate social development Notable stress precipitating psychosis Good prognosis
Solomon & Zlotowski (1964)	Socially inadequate premorbid personality Insidious onset No precipitating factors Progressive deterioration Poor prognosis	Socially adequate premorbid personality Sudden onset Stress precipitated Occurs later in life Non-deteriorating course More favourable prognosis
Cancro & Sugerman (1968)	Premorbid autism Insidious onset Presence of Bleuler's fundamental signs Langfeldt's signs of "true" schizophrenia during the episode Poor prognosis	Relatively adequate social and occupational adjustment Sudden onset Absence of fundamental signs Good prognosis
Strauss (1973)		Brief hospitalization, higher probability of discharge, and less likely to be rehospitalized
Rolf & Harig (1974)	Poor premorbid history Earlier age of onset Longer hospitalization Poorer prognosis	Good premorbid history Later age of onset Shorter hospitalization Better prognosis

TABLE 3 - (CONTINUED...)

Author	Process	Reactive
Houlihan (1977)	Insidious onset Lack of precipitating factors	Acute onset Significant precipitating factors

It seems therefore that what is meant by process and reactive schizophrenia is really a matter of prognosis. It should also be clear that premorbid functioning, defined by Kokes et al (1977) as those characteristics of a person, especially his interpersonal relations and occupational functioning, that can be found any time before the onset of florid symptoms of schizophrenia, can be subsumed as a dimension by a good-poor prognosis categorization. However, these categories are not clear cut such that reactive = good-premorbid = good prognosis and vice versa. Three recent reviews (Houlihan, 1977; Vaillant, 1978a; 1978b) make it clear that patients with extremely good post-hospital adjustment are not always patients with good-premorbid histories or with reactive characteristics. As Vaillant (1978) concludes: these different definitions of schizophrenia all encompass a group of patients who are likely to show remission, but each definition includes a slightly different, if overlapping population of patients.

In addition to their relationship to prognosis, process and reactive categories have been found to produce homogeneity of performance among schizophrenics on behavioural and cognitive measures, sometimes to the extent of the two groups differing in opposite directions from a control group. For example, Harris (1957) on a size estimation task, found that reactives underestimated and process patients overestimated size, whereas normals did not differ from veridicality. In other studies, process and reactive patients have been found to differ from one another on a wide variety of skills and behaviours, from abstract

ability to affective responsiveness. These findings have been amply documented in a number of major reviews (Higgins, 1964; Yates, 1966; Higgins, 1969; Houlihan, 1977). The problem arises in trying to explain the nature of these groupings, their relationships to prognosis and to differential task performance. As Sappington (1977, p.259) says "conceptual difficulties proceed from the uncertainty as to what constitutes primary variance in process and reactive schizophrenia. Granted that subjects can be reliably designated as process or reactive, the fundamental substrate of that distinction is, as yet, an empirical question".

4.2 THEORIES OF PROCESS-REACTIVE SCHIZOPHRENIA

Although it is always artificial to group together the views of a number of authors, there is pragmatic utility in drawing together similar assumptions and assertions so that the possibilities of explanation are demarcated. In this respect, it appears as if there are four major views on the nature of the process-reactive dimension. They are:

- Process-Reactive as two separate illnesses
- Process-Reactive as a dimension of severity of a single disorder
- Process-Reactive as a measure of social competence
- Process-Reactive as an artefact of a number of prognostic signs

4.2.1 Process-Reactive as Two Separate Illnesses

Garmezy & Rodnick (1959) revived the Bleulerian notion of a process (organic)-reactive (psychogenic) split, and for a short while such a view received some support, mainly from Rorschach studies using indicators of organicity (for example, Herron, 1962; Higgins & Peterson, 1966). However, this is no longer the sense in which process-reactive is thought of as separate illnesses. The debate at this point revolves around whether reactive (good-prognosis) schizophrenia is a variant of schizophrenia or manic-depressive psychosis. The controversy also raises the issue of the value of classifying the functional

psychoses into manic-depressive psychosis and schizophrenia (Ollerenshaw, 1973). Two aspects of good-prognosis schizophrenia provoke this debate: firstly, the presence of affective symptomatology during the acute phase; and secondly, the positive prognostic significance of manic-depressive heredity. In fact, the very existence of the category "schizoaffective" in our nosology typifies this confusion, as careful reading of the DSM II reveals that it fails to demarcate the schizoaffective state from either an acute schizophrenic reaction or the major affective disorders, despite being classified as a sub-type of schizophrenia (Procci, 1976).

Considering the presence of affective symptoms first: Zubin et al (1961) in a review of 800 prognostic studies found that affect, overtly expressed in either direction, was a good prognostic sign in all 159 studies which included the variable. Similar results have been obtained in more recent studies (for example, Mc Cabe et al, 1971). However, Bromet, Harrow & Tucker (1971), using a sample of 276 schizophrenics, found that depressed mood did not distinguish between those who did or did not stay in hospital longer. Nonetheless, the weight of the evidence does suggest that affective symptomatology is a good prognostic sign. With regard to heredity, a number of family studies have confirmed earlier findings of a relationship between affective disorders in a family and good prognosis in a schizophrenic proband (Robins & Guze, 1970; Cohen et al, 1972; Fowler et al, 1972; Mc Cabe et al, 1971, 1972; Tsuang et al, 1974, 1976; Taylor & Abrams, 1975). One conclusion that can be drawn from this data is that good-prognosis schizophrenia is a separate illness from schizophrenia and is really a variant of manic-depressive psychosis (for example, Stephens, 1978); on the other hand, one could argue that the distinction is arbitrary and that we really do not know whether there is any valid boundary between schizophrenia and manic-depressive illness (for example, Kendell, 1972; Ollerenshaw, 1973; Bleuler, 1974; Procci, 1976; Strauss & Carpenter, 1978; Vaillant, 1978). The latter conclusion would entail accepting

that depressive symptoms are part of the presenting picture of some schizophrenics; this was the interpretation Shanfield et al (1970) offered for their findings, and was certainly the view held by Bleuler when he said that "All the phenomena of manic-depressive psychosis may also appear in our disease; the only decisive factor is the presence or absence of schizophrenic symptoms" (1911, p.304). Cross national studies (for example, Kendell et al, 1971; Kendell, 1972) appear to support an overlap between the two which is largely terminological, that is, the expansion of the American concept of schizophrenia at the expense of manic-depressive psychosis. However, the issue can only be further clarified by asking three questions:

- Do good and poor prognosis schizophrenics show different symptom patterns?
- Does the good-poor prognosis dimension (or any of its synonyms) give rise to a dichotomy that would justify a clear differentiation of the disorders?
- Do descriptive factors, such as age of onset, indicate a relationship between good-prognosis schizophrenia and manic-depressive psychosis?

Although answers to these questions will be sought in the present study, some evidence is already available and is described below:

Do good and poor prognosis schizophrenics show different symptom patterns? Although Taylor (1972) did find that Schneider's First Rank Symptoms were more common amongst poor prognosis schizophrenics, a large number of studies have contradicted this finding, including the International Pilot Study of Schizophrenia (Carpenter, Strauss, Muleh, 1973; Carpenter & Strauss, 1974; Hawk, Carpenter & Strauss, 1975; Durell & Katz, 1977; Strauss & Carpenter, 1978). It therefore does not appear as if good and poor prognosis schizophrenics show different symptom patterns.

Does the good-poor prognosis dimension give rise to a dichotomy that would justify a clear differentiation of the disorders? Wittman (1941) found a marked bimodality of scores from a schizophrenic sample on her Elgin Prognosis Scale, and on this basis concluded that they were separate forms of the illness. Gittelman-Klein & Klein (1969) substantiated this finding of an "either-or" phenomenon. However, a number of authors have argued that these results might have been an artefact of a tendency of raters to assess schizophrenics in accordance with an overall impression of whether the patient was process or reactive (Chapman, Day & Burstein, 1961; Herron, 1962).

Although it has been asserted that the process-reactive dimension constitutes a continuum rather than a dichotomy (Becker, 1959; Garmezy & Rodnick, 1959; Solomon & Zlotowski, 1964; Higgins & Peterson, 1966; Strauss & Klorman, 1977; Strauss & Carpenter, 1978), the issue has not yet been resolved.

Do descriptive factors indicate a relationship between good-prognosis schizophrenia and manic-depressive psychosis? Schizophrenia has been found to differ from the affective disorders on two counts: firstly, age at first admission and secondly, on the amount of time patients spend in hospital per admission (Salzinger, 1973). Only one study appears to have examined the similarity between age of first admission of good-prognosis schizophrenics and affective disorders and found that this age was closer to that for schizophrenia (28,9 years) than for affective disorders (34,2 - 43,7 years) (Tsuang, Dempsey & Rauscher, 1976).

Answers to these questions will provide further clarification on the issue of whether process-reactive schizophrenia constitutes two separate illnesses and whether reactive schizophrenia should be thought of as a variant of schizophrenia or of manic-depressive psychoses.

4.2.2 Process-Reactive as a Dimension of Severity of a Single Disorder

"One may be dealing with one group that is sick and another group that is sicker" (Tutko & Spence, 1962 in Higgins & Peterson, 1966, p.202). Similarly, Becker (1959) argued that process-reactive schizophrenia may be viewed as endpoints on a continuum of severity. Three lines of evidence have contributed to a severity hypothesis of process-reactive schizophrenia. Firstly, that an overlap between time spent in hospital (that is, chronic status) and process schizophrenia has been found (De Wolfe, 1968). Secondly, diagnostic studies using the MMPI, NOSIE, and other scales, have found process schizophrenics to be more disturbed than reactives (Davis & De Wolfe, 1971; Keck, 1974); and thirdly, in the majority of studies, reactives have been found to be superior to process schizophrenics on behavioural and cognitive tasks (Becker, 1959). As Higgins & Peterson (1966, p.202) conclude "that a group of individuals who are judged to be inadequate should be inferior on various experimental tasks to a group judged to be more adequate is hardly surprising .... but to be of genuine utility, the process-reactive concept must be shown to have some surplus meaning above and beyond simple quantitative differences in severity of illness". In order to discount such a view of process-reactive schizophrenia it would have to be demonstrated that: firstly, a process and reactive division results in differential rather than graded performance, as in the Harris study (1957); secondly, that the distribution of factors associated with process-reactive designation (for example, precipitating factors, acute onset, etc.) are not affected by the severity of the illness. An attempt will be made, in this study, to test these two conditions.

4.2.3 Process-Reactive as a Measure of Social Competence

Based on Sullivan's notions of malignant and benign schizophrenia (1924), this point of view was originally put forward in a series of papers by Kantor et al. This theory predicted

severity of pathology on the basis of the age at which pathognomic experiences occurred (Kantor & Winder, 1959; Kantor & Winder, 1961; Kantor & Jackson, 1962). These authors subscribe to a unitary view of psychopathology such that disorders are viewed as a consequence of failure to cope with developmental tasks. Certain individuals, having acquired few social skills or resources, are seen to be more likely to have poorer prognoses than patients who are more socially competent, and who thus have more skills to help in facing problem areas (Phillips, 1953; Phillips, Broverman & Zigler, 1966; Harrow, Tucker & Bromet, 1969; Bromet, Harrow & Kasl, 1974). Adolph Meyer was the first to emphasise the importance of social competence to schizophrenia, arguing that schizophrenia resulted from an accumulation of faulty habits and reactions to life experiences (Zubin & Spring, 1977). The crux of contemporary views in this regard is that the relationship between the level of premorbid competence and prognosis, so generally accepted as existing for schizophrenic patients, is not unique to schizophrenia, but cuts across all functional mental disorders (Rosen et al, 1969). Studies which have examined the extent to which premorbid competence rating scales can predict prognosis for non-schizophrenic psychiatric patients, have failed to establish a link between premorbid levels and prognosis for patients other than schizophrenics (Harrow, Tucker & Bromet, 1969; Rosen et al, 1969; Bromet, Harrow & Tucker, 1971; Bromet, Harrow & Kasl, 1974). In fact, the one study which appears to have investigated the histories of process and reactive schizophrenics in detail, did not support a differentiation based on social competence, but found instead that both groups had had long histories of psychosocial difficulties and disturbances (Serban & Woloshin, 1974).

However, a number of authors continue to assert that psychopathology involves a comprehensive impairment of competence (Hamlin & Lorr, 1971), and that the process-reactive division should not be seen as a component of schizophrenia per se, but as reducible to a social competence dimension which can be

measured across people generally (Ledwell, 1974). The evidence for this point of view is drawn from the correlation between factors which can be interpreted as indices of social competence and prognosis, such as marriage, socioeconomic status, I.Q. and education, among others.

Marriage - While there is ample support for the view that marital status is a potent predictor of outcome (Walker & Kelley, 1960; Farina et al, 1962; Farina, Garmezy & Barry, 1963; Solomon & Zlotowski, 1964; Garfield & Sundland, 1966; Meichenbaum, 1969; Bromet, Harrow & Kasl, 1974; Klorman, Strauss & Kokes, 1977), a few studies have failed to confirm the relationship (for example, Vaillant, 1962; Allon, 1971), and the interpretation of the finding remains controversial. It may be apposite to first consider the findings, and then to scrutinise the interpretations: firstly, the relationship between marital status and prognosis does not hold for females (Farina et al, 1962; Vaillant, 1962; Klorman, Strauss & Kokes, 1977). Secondly, in males and females, marital status is associated with the incidence of schizophrenia. Single individuals are over-represented among schizophrenic populations (Gittelman-Klein & Klein, 1968; Turner et al, 1970). Thirdly, there is some evidence for the conclusion that marital status and severity of pathology are not independent; that is, amongst the single and previously married, there is a preponderance of cases with severe pathology (Turner et al, 1970).

A number of interpretations, not necessarily mutually exclusive, have been placed on this data: Firstly, an interpretation based on a social competence hypothesis, which holds that "the more mature and more adequately functioning males are more likely to marry, and because of their greater maturity are also likely to recover more rapidly from a schizophrenic episode than single males. The greater social maturity of married as compared to single males is suggested by the fact that to marry, each, typically, has had to make advances to a

female, court her, propose marriage and offer a home and economic support" (Farina et al, 1962, p.56). The lack of a marriage-prognosis relationship for females is accounted for by proposing that the same type of initiative is not required of females in the social act of marriage (Farina et al, 1962; Held & Cromwell, 1968). An argument against such a view is that due to the great changes in sexual conventions that have occurred, unmarried or divorced status may not be a valid indicator of maladjustment or uninvolvement in heterosexual relationships (Mc Creary, 1974; Klorman et al, 1977).

The second interpretation is based on a severity-of-illness foundation and holds that, given the incipient nature of schizophrenia, marriage is made less likely, and given marriage, is likely to speed divorce or separation. "The more disordered an individual, the less likely he will find a marital partner and the more likely he will spend extended periods in hospital" (Turner, et al, 1970, p.115). This view received support from Klein et al's study (1971) in which they found that, on a 3-year follow up of 81 patients, single patients were more often rehospitalized than married patients. However, given a significant relationship between age of first psychiatric hospitalization and marriage, they argued that the predictive power of marital status was derived from its relationship with age at first treatment. Supporting this, they found that a significant number of early treated patients were rehospitalized regardless of whether they were married or not.

The last interpretation, simply stated, argues that the likelihood of discharge may be greater for a man who has a wife and children at home (Held & Cromwell, 1968). Considering that good prognosis broadly implies remission of symptoms, and the most common measure of prognosis is length of hospitalization, it could be that the current findings are an artefact of discharge practice and treatment philosophy (Meichenbaum, 1969; Vaillant, 1978).

In conclusion, an interpretation of a social competence-prognosis relationship based on marriage is not necessarily a valid one.

Socioeconomic Status - Lower social class patients are more often assigned a process rating, and vice versa (Magaro, 1967; Allon, 1971; Beck, 1978). In addition, higher social class patients have been found to have a better symptomatic outcome than lower social class patients and less likely to be continuous long-term patients (Kohn, 1973). Whether these findings should be interpreted on a personal incompetence level ("the drift hypothesis") or on a wider economic basis ("the stress hypothesis") is still an open question (Dunham, 1971; Shean, 1978). At least, the data cannot be definitively used to support a personal social competence argument.

I.Q. and Education - The earlier finding that process schizophrenics had a drop in their I.Q.'s in childhood, relative to reactives, has since been found to have been an artefact of socioeconomic status (Hamilton, 1976). Early writers did not attach prognostic significance to education or intelligence (Blair, 1940), and in their review of 1941, Chase & Silverman (Offord & Cross, 1971, p.431) concluded that "the relationship of education and intelligence to prognosis is very uncertain and no definite significance can be ascribed to these criteria".

In fact, Farina et al (1962) found that there was a trend for their non-recovered group to have had more education than the recovered group. Even if one accepts that education and intelligence are aspects of social competence, the evidence does not appear to support a relationship between these factors and prognosis.

In conclusion, although the social competence interpretation of the process-reactive dimension has the support of the many

authors quoted, the model does not give rise to consistent findings. An attempt to test some of its implications will be made in the present study.

4.2.4 Process-Reactive as an Artefact of a Number of Prognostic Signs

A number of authors have expressed reservations about simplistic explanations of the relationship between process-reactive categorization and prognosis, and have argued that the dimension may be confounded by demographic and cultural variables and/or simply expose artefacts of hospital practice (Shakow, 1963; Chapman & Baxter, 1963; Salzinger, 1971; Klorman et al, 1977). Taking these reservations to their extremes, it may be that the process-reactive dimension has no coherent theoretical significance at all, at least in terms of illuminating disease entities, severity of illness or a broad underlying competence dimension of psychopathology. It may simply represent the empirical result of collecting together all known prognostic indices, each index having prognostic significance for different reasons. Prognosis, however defined, is possibly the result of a complex interplay between disease-related factors, treatment factors and social factors, and the unidimensional models so far proposed, cannot account sufficiently for all the relationships between these variables.

As a conclusion to this review of process-reactive theories, the following quotation would seem appropriate: "The construct of premorbid adjustment has been useful in the prediction of hospital discharge and of various behavioural and perceptual measures in male schizophrenics. However, the time seems imminent for the construct to evolve itself out of existence. Now rather than continuing the group subclassification of premorbid adjustment, it seems more important to investigate components which have accounted for its predictive value" (Held & Cromwell, 1968, p.269).

4.3 THE MEASUREMENT OF THE PROCESS-REACTIVE DIMENSION

Wittman developed the first major scale that quantified dimensions

of premorbid function, the Elgin Prognostic Scale (1941). It was based on a review of prognostic studies, and after refinement, consisted of 15 items relating to premorbid adjustment and 5 items relating to symptomatology. The broad areas covered were: childhood personality patterns, rate of onset, precipitating events, presenting symptoms, duration of psychosis and body build. Due to a number of problems such as item-ambiguity, crossover of content between items, and outmoded somatotype characteristics, the scale is no longer in general use (Kokes et al, 1977).

In 1953, Phillips devised the Phillips Prognostic Rating Scale which almost became the standard research instrument, mainly due to the extensive investigations of Phillips, Zigler and others (Rodnick & Garmezy, 1959). The original scale included three parts: Part One: Premorbid History; Part Two: Possible Precipitating Factors, and Part Three: Signs of the Disorder. However, due to the fact that Part One had the highest relationship with the original outcome criterion and a high correlation with the total score, the originators relied primarily on Premorbid History Scores in subsequent divisions of schizophrenics. Other investigators have followed this lead (Kokes et al, 1977). Reliability checks on the scale have generally yielded good results (Garfield & Sundland, 1966; De Wolfe, 1968); some investigators have, however, failed to establish good inter-rater reliability (Watson & Logue, 1968, 1969). Support for the general predictive validity of the scale has been substantial (Farina et al, 1962; De Wolfe, 1968; Cancro & Sugerman, 1968; Strauss & Carpenter, 1978). Despite the relatively good performance of the instrument, a number of problems remain: the inadequacy of information in case records on which the scale is based (Mc Creary, 1974); the possibility that the scale may fail to distinguish differences in adjustment from subcultural differences in that it relies on behaviour which often varies with subculture (Chapman & Baxter, 1963): and the potential distorting influence of the rater, in that it is conceivable that a clinician, after having formulated a diagnostic opinion, might subsequently record a patient's history in a consistent pathologic

framework (Higgins, 1969; Bromet et al, 1974).

Since the development of the Phillips scale, a large number of measures have been reported in the literature; for example, the Zigler & Phillips Premorbid Social Competence Scale (1962); the Barron Ego Strength Scale (1953); the General Information Questionnaire (De Wolfe, 1968), etc. None of these scales have been used extensively (Higgins,& Peterson, 1966; Kokes et al, 1977). Ullmann & Giovannoni (1964) developed an instrument to measure premorbid functioning more efficiently and with a more standard source of information than previous attempts. The format is self-report and avoids the uneven and idiosyncratic nature of information available in hospital records, as well as the potential distorting bias of raters. The questionnaire was based on the Sullivanian and Meyerian conceptualization of schizophrenia referred to earlier, that is, that degree of pathology is related to degree of social maturity attained before breakdown. The scale consists of 24 true-false biographical items, selected from an initial pool of 77 items, tapping the content areas of social functioning and psychiatric symptomatology. The relevance of the items to the process-reactive continuum was cross-validated on the basis of item-total correlations from successive administrations of the questionnaire to a sample of 100 schizophrenic patients. It was then cross-checked by being administered to another sample of 638 patients. The internal reliability of the scale was established by the finding of an odd-even correlation of 0,80 on the questionnaire from an additional sample of 122 hospitalized psychiatric patients.

"The questionnaire is referred to in positive terms in the literature, but due to its relatively recent development it has not been used as extensively as some of the other scales" (Kokes et al, 1977, p.194). Evidence for its predictive validity has been provided by a number of studies (Held & Cromwell, 1968; Meichenbaum, 1969; Watson & Logue, 1969; Mc Creary, 1974; Wagener & Hartsough, 1974). Evidence for its concurrent validity comes from several studies finding significant correlations

between the Ullmann-Giovannoni questionnaire and other prognostic scales and indices, particularly the Phillips Scale and marital status (see Table 4).

TABLE 4 - CORRELATIONS BETWEEN ULLMANN-GIOVANNONI TOTAL SCORES, OTHER PROGNOSTIC SCALES AND MARITAL STATUS (Kokes, Strauss & Klorman, 1977, p.201)

	ELGIN	PHILLIPS	MARITAL STATUS
ULLMAN-GIOVANNONI QUESTIONNAIRE	r = ,45[1]	Ø = -,87 and -,38[2] r = -,75 and -,56[3] r = -,11 and -,14[4] r = -,60[1]	r = ,51[1] Ø = ,41 and ,87[2] r = ,78[5] Ø = ,64[6]

1. Watson & Logue (1969)
2. Held & Cromwell (1968)
3. Johnson & Ries (1967)
4. Magaro (1968)
5. Meichenbaum (1969)
6. Solomon & Zlotowski (1964)

Note:

The Phillips Scale and the Ullman-Giovannoni Scale are scored in opposite directions; therefore a low score on the former and a high score on the latter would indicate reactive schizophrenia and vice versa for process schizophrenia.

Only Magaro (1968) found an insignificant relationship between the Ullmann-Giovannoni and the Phillips, using a sample consisting of chronic male schizophrenics.

Mc Creary (1974) argued that although the Phillips Scale was the most frequently used, and had demonstrated the most heuristic value, its high correlation with the Ullmann-Giovannoni (0,78, $p<0,05$) made it appear as if the two scales could be regarded as assessing the same phenomenon. Held & Cromwell (1968), arguing from the same basis, made the point that, "while the Phillips classification itself is not a criterion of perfect reliability, its research utility justifies the exploration of the Ullmann as an improvement in efficient methodology" (p.268). It must be noted though that Kilburg & Siegel (1973) found an unimpressive

relation between the two scales (0,46), which although significant, accounted for only 21% of the variance and they thus concluded that the two instruments measured something different. On face value, the two scales do appear to differ to quite a large extent. Part One of the Phillips has three subscales which have a very similar emphasis: social aspects of recent sexual life, recent sexual adjustment, and recent and past adjustment in personal relationships. The Ullmann-Giovannoni questionnaire, on the other hand, elicits a much wider range of information, including relationships, employment history, hospitalization experience, precipitating events, personal and social independence, etc. The exact nature of the relationship between these two instruments has not been clarified.

In this chapter an attempt was made to illuminate the nature of the questions in relation to the process-reactive dimension of schizophrenia, and to clarify the expectations and implications derived from each of the major theories about the nature of the dimension; that is, whether process-reactive should be thought of as two disease processes, whether it simply dichotomises a severity continuum, whether premorbid competence is an integral aspect of the manifestation and outcome of schizophrenia, and lastly, whether the dimension itself is not but an artefact of combining prognostic factors which differ in their relationship to prognosis. The research questions raised by these theories were articulated. In addition, the nature of the measuring process and the relationships between process-reactive instruments was explored.

S E C T I O N T W O

CHAPTER 5 - THE PROCESS-REACTIVE STUDY

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SECTION TWO

CHAPTER 5 - DESIGN OF THE PROCESS-REACTIVE STUDY

This chapter will begin with an examination of the relationship between the process-reactive dimension and Cromwell's high and low redundancy groups. Following this, the design and method of the process-reactive study will be described.

5.1 JUSTIFICATION

There are two reasons why an investigation of the process-reactive dimension should precede an examination of Cromwell's hypotheses regarding the information processing characteristics of certain subgroups of schizophrenics. In order to elaborate these reasons, pertinent aspects of Cromwell's theory require articulation.

The first reason concerns the extent to which Cromwell's theory is based on the findings of process-reactive differences in schizophrenics, in premorbid behaviour, manifestation of the breakdown and prognosis, amongst others. In describing his high and low redundancy groups, Cromwell (1972) asserted that "although these patterns are similar to dichotomies previously associated with schizophrenia, the two patterns are primarily categorized here by levels of input of stimulus information" (p.128). The dichotomies he refers to as being previously associated with schizophrenia are those of process reactive and paranoid-nonparanoid. However, Cromwell then proceeds to describe the high and low redundancy groups in a way which makes it evident that the categorization is based on findings of process-reactive differences. This is clearly illustrated in Table 5 overleaf, which summarises Cromwell's descriptions of high and low redundancy schizophrenics.

TABLE 5 - CROMWELL'S (1972) DESCRIPTIONS OF HIGH AND LOW REDUNDANCY SCHIZOPHRENICS (Pages 128-132)

The High Redundancy Group	The Low Redundancy Group
Schizophrenic spectrum disorders tend to occur among the biological relatives.	No evidence to suggest an hereditary contribution to the disorder.
Premorbid adjustment poor.	Premorbid adjustment good.
Onset of symptoms gradual.	Sudden onset.
Reason for hospitalization is loss of social supports rather than onset of symptoms.	Hospitalization follows the onset of symptoms.
The period immediately after hospitalization is characterized by chronic symptoms.	Florid, or acute symptoms evident in the period immediately following hospitalization.
Symptoms are more likely to be paranoid than nonparanoid.	Symptoms are evenly distributed between paranoid and nonparanoid
"Soft signs" of organicity show up on perceptual tests.	Little or no evidence of organicity.
Phenothiazine therapy improves quantitative measures of performance.	Tend not to improve in performance measures following phenothiazine therapy.
Discharge dependent on stabilized pathology and community receptivity.	Discharge dependent on remission of symptoms.
Long term prognosis poor.	Long term prognosis relatively good.
High arousal is reflected by a number of indices.	Relatively lower arousal.
Readmissions result from changes in the social enviromment.	Readmissions result from reoccurrence of symptoms.
High amounts and variability of stimulus informational input are rejected. This is concluded from studies showing a preference for and consequent improved performance following stimulus deprivation; patterns of size estimation and incidental visual recall which are characteristic of minimal scanners.	Distaste for and behaviour decrement following stimulus deprivation. They show patterns of size estimation and incidental visual recall which are characteristic of extensive scanners.

Scrutiny of these descriptions, and the evidence upon which it is based (1972), illustrates that the table represents a summary of some of the differences which have been found between process and reactive schizophrenics. In effect, Cromwell has renamed the process-reactive groups, calling them high and low redundancy schizophrenics respectively. None of the descriptions offered are based on a prior distinction between two groups of schizophrenics who had been found to have different "levels of input of stimulus information", to reiterate the earlier quote from Cromwell. Therefore Cromwell's assertion of a primary categorization based on levels of input of stimulus information is misleading. The process-reactive differentiation precedes the categorization based on levels of input and not vice versa. Therefore, if groups of schizophrenics are found to be distinguishable on the basis of preferred levels of input, these groups will have to be shown to correspond to groups of schizophrenics categorized as process or reactive. If not, Cromwell cannot have recourse to the process-reactive evidence which he has called upon to support and elaborate his redundancy formulation. In other words, Cromwell's theory is dependent on an overlap being found between process-reactive membership and preferred levels of input.

The second reason why an examination of the process-reactive dimension is necessary to a test of Cromwell's theory is articulated by Higgins & Peterson (1966): "The process-reactive concept is surrounded by a number of issues which require resolution prior to the development of a theoretical position based on process-reactive findings" (p.205). That is, any theoretical account would need to be based on an interpretation of the meaning of the empirical data generated by the process-reactive distinction. At present, the mass of findings have little significance other than demonstrating the potential for a coherent subdivision of the schizophrenic group. To utilize these findings in a theoretical network necessitates an interpretation of their significance; in addition to which, evidence for the interpretation must be found if the theory is to be supported. Four possible interpretations of the

meaning of the process-reactive distinction were outlined in Chapter 4. Cromwell's theory is dependent on support being found for an explanation of the process-reactive distinction which is congruent with a differentiation of schizophrenics in terms of preferred levels of stimulus information.

In terms of the four possible explanations of the process-reactive distinction outlined in Chapter 4, Cromwell appears to entertain the possibility of either "severity" or "separate diseases" as the substrate of the process (high redundancy)-reactive (low redundancy) distinction. This is illustrated in Table 6 below which contrasts his earlier and later views on these two possibilities.

TABLE 6 - THE CONTRAST OF CROMWELL'S VIEWS ON "SEVERITY" AND "SEPARATE DISEASES"

"Severity"	"Separate Diseases"
1968 p.373 "Could the results be explained on the basis that the subgroups differed merely in degree of "sickness" rather than qualitatively from one another?"	1968 p.374 "Regarding different types of schizophrenic disorder, such a possibility readily presents itself. However, this possibility must be viewed with great caution. The differences among the subgroups studied here may represent differences in rates of progression and in temporal phases of the same disorder. Also they may represent personality differences independent of the schizophrenic disorder but onto which it is superimposed".
1972 p.132 "Among all these measures the high redundancy schizophrenics are indeed usually more severely impaired than the low redundancy schizophrenics".	1972 p.132 "The data indicate that the more parsimonious position is that at least two fairly independent disorders occur".

These two hypotheses are more conceivably related to preferred levels of input than are the other two competing explanations of the process-reactive distinction, that is, social competence and the cumulative effects of various prognostic indicators. There are no obvious reasons why variables correlated with prognosis should be associated, in the same individuals, with preferred levels of input. Similarly, it is not clear exactly how social competence would influence levels of input. Lerner (1968) reported a positive relationship between cognitive-perceptual functioning, as assessed by the Rorschach, and social competence. However, Garmezy's (1979) assumption of the relationship between attention and social competence seems premature. He stated that "skills acquisition appears to be heavily dependent upon attentional focusing. To work effectively and to relate well to others requires the ability to attend in a responsive, integrated and competent manner" (p.26). While this statement might be true, it might also be trivial if attention is used here to refer to everyman's notion of attention. When taken to refer to attention, as defined in experimental studies, its relationship to social competence is, as yet, obscure (Neisser, 1974).

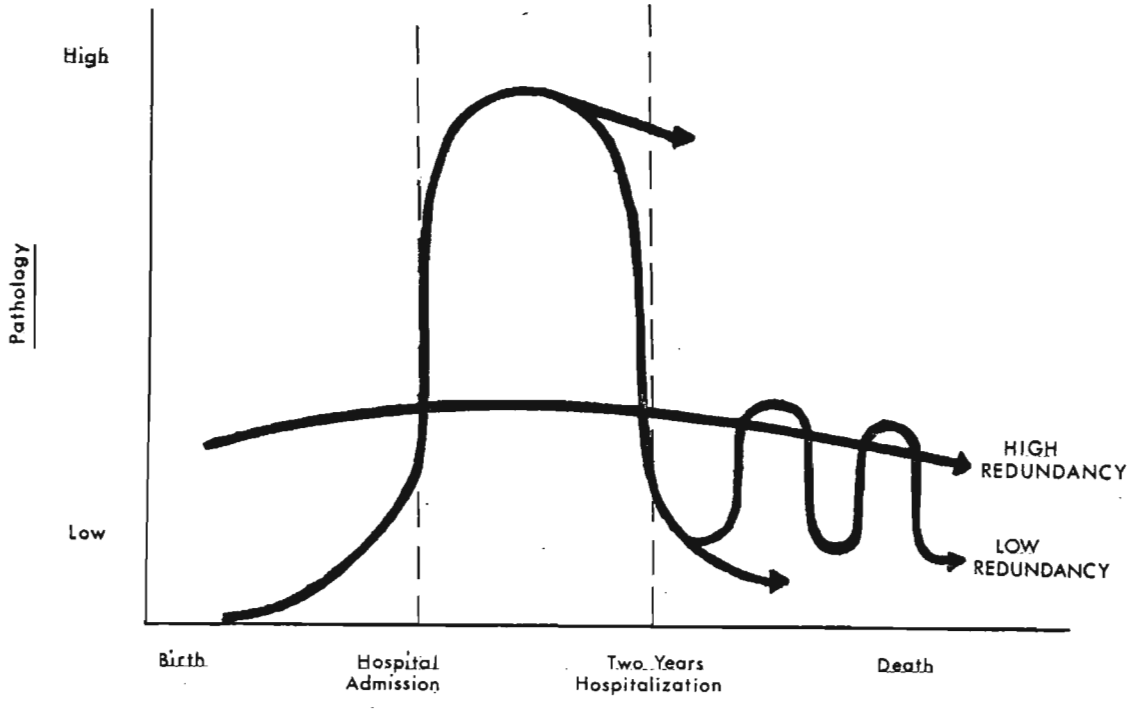
In summary, Cromwell assumed identity between high and low redundancy and process and reactive schizophrenics, respectively. (Table 5); he also speculated about the possible substrate of the differences between these groups of schizophrenics (Table 6). In addition, he offered a number of views on the course and form of high and low redundancy schizophrenics, which, given the assumption of identity, should also be applicable to process and reactive schizophrenics.

Firstly, the role of the paranoid-nonparanoid dimension in Cromwell's theory is unclear. In 1968 he argued that paranoid-nonparanoid was an important subdivision and that process-nonparanoids and reactive-paranoids were two extreme groups. In 1975, he asserted that clinical manifestations such as paranoid symptoms may be of little importance to an understanding of schizophrenia, arguing that these symptoms may reveal more about the cognitive level of the individual

than about the disorder. At this stage he proposed that the paranoid designation was a function of premorbid status, quoting as evidence findings which showed a higher proportion of paranoids among good premorbid patients. A number of authors (for example, Houlihan, 1977) believe that Cromwell, in his later view, may have underestimated the utility of the paranoid dimension.

Secondly, Cromwell has speculated about the nature of the relationship between the high and low redundancy typology and outcome; he has depicted this relationship in a graphic form, shown in Figure 1.

Figure 1 - Illustration of the progression and amount of pathology in high and low redundancy schizophrenics during their life span (Cromwell, 1972, p.128)



From this illustration it can be seen that Cromwell envisaged the high redundancy (process) group as having a low but chronic level of pathology. On the other hand, there is great variability in the low redundancy group, both in periodicity of pathology and outcome. Presumably the figure is mainly illustrative and the variability in outcome simplified for this purpose. Nonetheless, it is clear that Cromwell anticipated uniform outcome in one group and highly variable

outcome in the other. The episodic nature of some schizophrenic disorders is well documented (Zubin & Spring, 1977), and amply demonstrated by Manfred Bleuler's life-time follow up of 208 schizophrenics (1974). In the Russian literature, approximately 30% of schizophrenics are reported to show a periodic form (Holland & Shak, 1977). Whether this episodic form is restricted to low redundancy schizophrenics, as Cromwell proposes, is however, unknown.

Despite the lack of clarity in Cromwell's theory, it does offer a logical basis for linking the process-reactive dimension to the performance of schizophrenics; in this instance, on information processing tasks. A great many investigations into different aspects of the functioning of schizophrenics, have incorporated the process-reactive and/or the paranoid-nonparanoid dimensions; however, the inclusion of these dimensions has usually been on a purely empirical basis, for the purpose of rendering the schizophrenic group less heterogeneous. Seldom has any clear rationale been offered for the expectation of process-reactive or paranoid-nonparanoid differences. As a result there has been a steady accumulation of findings of differences, or lack of differences, between subgroups of schizophrenics, without a theoretical framework within which these could be interpreted. Cromwell's theory provides such a framework, albeit in a rudimentary form at present.

Other than the work of Cromwell and his colleagues, there appear to have been only two published studies which explicitly aimed to test some aspect of Cromwell's theory: Hirt, Cuttler & Genshaft, 1977, and Asarnow & Mann, 1978. These studies will be examined in Chapter 9, along with other recent work on information processing in schizophrenics. However, major aspects of Cromwell's theory have not been tested; in particular, the relationship between the process-reactive dimension and cognitive behaviour thought to be indicative of high or low redundancy functioning.

5.2 GENERAL AIMS OF THE INVESTIGATION

From the preceding discussion it should be evident that Cromwell's

theory can be tested at two levels: firstly at the level of the process-reactive dimension, and secondly at the level of cognitive behaviour. The present study aimed, in two parts, to assess both these levels. In the first part of this study, the various interpretations of the process-reactive dimension were examined, as well as Cromwell's views regarding the role of the paranoid-nonparanoid dimension, and the nature of the course and outcome of the disorder in these subgroups of schizophrenics. In the second part of this study process-reactive differentiation and measures of preferred levels of input of stimulus information were examined in order to test the degree of overlap between the two, as predicted by Cromwell's theory.

5.3 AIMS OF THE PROCESS-REACTIVE STUDY

The specific aims of this first part of the investigation were:

- to examine the evidence for Cromwell's views on the substrate of the process-reactive dimension;
- to assess the role of the paranoid-nonparanoid dimension;
- to evaluate the course of the disorder in subgroups of schizophrenics.

5.3.1 The Substrate of the Process-Reactive Dimension

Four theories of the process-reactive dimension were outlined in Chapter 4. According to the literature review presented in that chapter, the various explanations of the dimension could give rise to specific findings, as outlined below:

- the view that process-reactive ratings identify two separate disorders would be consistent with findings of: different symptom patterns among these two groups; a dichotomy rather than a continuum of process-reactive scores; and a correspondence between process patients and schizophrenia, and between reactive patients and affective psychosis, on descriptive indices such as age of onset;

- the view that process-reactive ratings represent a dimension of severity would be consistent with findings of: graded versus differential performance by process and reactive patients on cognitive tasks; different proportions of process and reactive patients in groups distinguished from each other by severity; and different symptom ratings of process and reactive patients, such that process patients were seen to be more severely ill than reactive patients;

- if, however, process-reactive ratings represent assessments of social competence, one could expect that reactive patients would be found to be more socially competent than process patients on appropriate indices of such competence. In addition, such an explanation of the dimension predicts a relationship between process-reactive ratings and prognosis in psychiatric groups other than schizophrenics;

- lastly, the view that the process-reactive dimension is an artefact of differently based prognostic signs would derive support from findings which confirmed the relationship between the dimension and prognosis, and furthermore, the superiority of the dimension, over other isolated signs, in the prediction of prognosis. Finally, if it could be shown that the impact of the process-reactive dimension on prognosis was derived from the effect of one or a number of prognostic signs, this would enhance the plausibility of the dimension being an artefact of such signs.

It must be emphasised that confirmation of any of these proposals could provide only supporting evidence for one viewpoint rather than another; the findings would ultimately require interpretation in relation to evidence generated by other approaches to the complex issues involved.

5.3.2 The Paranoid-Nonparanoid Dimension

Considerable debate exists as to the importance of the paranoid

dimension to schizophrenia. Because of its foundation in symptomatology, some have argued that the distinction between these two types of schizophrenics is a fundamental one. On the other hand, Cromwell (1975) has suggested that diagnoses of paranoia may reflect artefacts of privileged hospital facilities and/or the intelligence level of the patient, rather than any quality of schizophrenia. In addition, there is little clarity as to the nature of the relationship between the paranoid dimension and that of process and reactive schizophrenia.

5.3.3 Outcome

As previously mentioned, the origin and continued importance of the process-reactive dimension has been attributed to its relationship with outcome; that is, that reactive and process schizophrenics have been regarded as synonymous with good and poor prognosis, respectively. In addition, Cromwell has postulated that reactive or low redundancy patients would show more variability in outcome than process or high redundancy patients, and that the former group would be more likely to have a periodic or episodic course.

The aims of the process-reactive study have been outlined in the form of three aspects of Cromwell's theory as it relates to the process-reactive dimension; that is, the nature of the dimension, its relationship to paranoid status and to the course and outcome of the disorder. The present study was designed to elucidate some of these issues in an attempt to evaluate the standing of Cromwell's theory.

Before describing the process-reactive study in detail, some general characteristics of the subjects which were common to both parts of the study, will be outlined.

5.4 GENERAL CHARACTERISTICS OF THE SUBJECTS

Only white males were included in all parts of this study. The status of cognitive and subgroup research in the field of schizophrenia is such that it does not yet justify extension to groups who

have not been widely investigated. The major need is for clarification and confirmation of basic concepts and this is most reasonably achieved by studying groups comparable to those used in other similar studies. In addition, as noted previously, the relationship between prognosis and premorbid classification has been found to be questionable when applied to females (Miller, Streiner & Woodward, 1978); while females are being ignored in schizophrenia research, their different patterns of admission, marital status and response to treatment (Wahl, 1977) make them unsuitable subjects for process-reactive investigations which aim to build on previous research information gained from males.

The patient groups were drawn from two large state mental hospitals and a psychiatric unit in a state general hospital. As such, the sample included the majority of white male patients in Natal, South Africa; excluding only those treated by private practitioners and one small psychiatric unit in a provincial general hospital (approximately 20 beds), where co-operation with the study could not be obtained. The admission patterns, by age, of white male schizophrenics in one year to one of the state mental hospitals is given in Table 7 below.

TABLE 7 - ADMISSION PATTERNS FOR SCHIZOPHRENICS IN THE SOURCE UNITS

Age of Patients	Number of Patients Admitted
6-18 years	2
19-40 years	48
41-60 years	42
61+ years	42

This pattern was similar for the other two units from which patients for this study were drawn (Fismer, 1977, pers. comm.)*.

* Fismer, K. Superintendent of the Fort Napier, Town Hill and Umgeni Waterfall Complex, Pietermaritzburg.

All subjects, including the controls, were aged 18-45 years in order to minimise the likelihood of diagnostic error at the fringes of these age groups in the psychiatric samples; the peak age of first admissions for schizophrenia falls between 25 and 40 years, after which the frequency tapers off (Cancro, 1969; Cromwell, 1975; Carpenter, 1976). Within this age limit, subjects were excluded who had an I.Q. below 80, a history suggestive of brain damage or alcohol abuse, and who had received electroconvulsive therapy within the last six months.

The normal control group comprised white male railway employees in the category of Grade II clerks. This group was specifically selected on the basis of having the same socioeconomic status as the majority of patients admitted to the institutions from which the sample was drawn. A previous study, which had used a modified form of The Hollingshead and Redlich Index, had established that the greatest percentage of patients admitted to these institutions were rated as belonging to Class IV (Krumm, 1972). According to the same index, using the occupational scale, clerical workers also fall into the Class IV category.

5.5 THE PRELIMINARY INVESTIGATION

Before commencing the study a suitable measure of the process-reactive dimension had to be established. Although the Phillips Premorbid Rating Scale had been put to widespread use in studies of this kind, it had proved to be an unwieldy research tool in that it required an extensive interview and/or comprehensive case history notes for a rating to be made. In comparison, the 24-item true-false Self Report Scale (Ullmann & Giovannoni, 1964), with its 11 filler items to combat response set, appeared to be convenient in research with large numbers. It was necessary, however, to assess whether, in the present context, the Ullmann-Giovannoni Scale would categorise the same patients as process or reactive as the Phillips, which had been used to operationalise these terms in many other studies. Concern has been expressed about the possibility of different scales selecting different groups of patients (Solomon & Zlotowski, 1964; Watson & Logue, 1969).

Within the patient-selection constraints outlined previously, all resident schizophrenics who had been hospitalized for at least one month were included in the preliminary study. The sample consisted of 46 subjects with file and ward diagnoses of schizophrenia; all patients were on maintenance doses of phenothiazines. Eight appropriately aged patients were rejected, 5 by the criteria stipulated, 2 who were extremely aggressive and 1 who was mute. Using the method of Ward & Carlson (1966), the patients were interviewed jointly by two raters who made independent assessments (of each patient) using the Phillips Scale, Part One (see Appendix B1). One rater was the author, who was familiar with the Phillips Scale and the literature on process-reactive schizophrenia. The other rater was an undergraduate psychology student, well acquainted with the Phillips Scale but relatively naive with regard to schizophrenic symptomatology, prognosis and the process-reactive literature. He was therefore less likely to make a global assessment of the patient's functioning and then to rate according to that clinical assessment (a previous criticism of the scale). The subjects were informed that participation was voluntary and that the information would be used for research purposes only. The interview material was supplemented by case history information where necessary. The subjects were then required to complete the Ullmann-Giovannoni Self-Report Scale without assistance from the inverviewer (see Appendix B2 - Biographical Checklist).

The raw scores are given in the Appendix A,I. A process patient was defined by a score between 1-12 on the Ullmann, or between 16-30 on the Phillips Scale. A reactive patient was defined by a score between 13-24 on the Ullmann, or between 1-15 on the Phillips Scale. The correlation between the two ratings on the Phillips Scale ($r \leq 0{,}93$, p 0,01), confirmed the reliability of the ratings. The correlation between the Phillips and the Ullmann scores ($r \leq -0{,}79$, p 0,01), led to the conclusion that the overlap in assignment to process-reactive categories was great enough to justify the use of the Ullmann, with the assumption that a sample, so selected, would not be significantly different from a Phillips-selected group. Similar conclusions have been reached in other studies (see Table 4).

5.6 THE PROCESS-REACTIVE STUDY

Three groups of schizophrenics, a group of acute nonschizophrenic psychiatric patients and a group of normal controls were interviewed to obtain material relevant to the aims of the study. This included demographic information, process-reactive ratings, assessment on a number of prognostic indices and a measure of prognosis.

The various patient groups were chosen to fulfil specific goals of the study:

- three groups of schizophrenics were included in order to enable comparisons of process and reactive characteristics across levels of severity; these were an acute, a chronic and an outpatient group of schizophrenics. Although there have been numerous studies comparing the performance of acute and chronic patients on various tasks, few process-reactive studies have incorporated systematic comparisons of these groups; instead, many investigators have formed samples from a cross-section of hospitalized patients, mixing new admissions with chronic patients (Klorman, Strauss & Kokes, 1977). The inclusion of remitted schizophrenics in such studies has been suggested as one method for distinguishing enduring characterstics of schizophrenia from state-dependent variables (Keith et al, 1976). It was hoped that, by examining the process-reactive dimension in relation to three states or phases of schizophrenia, the relationship between the disorder and the dimension could be clarified.

- an acute nonschizophrenic psychiatric group was included for two reasons. Firstly, in response to the call for such controls; as Higgins & Peterson (1966) argued, "It would seem that until control groups receive within-group process-reactive differentiation, the amount of variance attributable to schizophrenia as opposed to that contributed by differences in life adjustment, independent of psychopathology, will continue to remain in doubt" (p.204). Similarly, Wagener & Hartsough (1974) advocated such a control as a means of testing the specificity of dimensional approaches to

schizophrenia. The second reason for including this group was in order to test the degree of similarity between reactive schizophrenia and other nonschizophrenic psychiatric disorders; or, the extent to which reactive schizophrenics might differ from process schizophrenia in such a way as to support claims that the two states are separate disorders.

The measures used and the characteristics of the subject groups will be described in the following sections.

5.6.1 Subjects

The five groups, each consisting of 40 subjects, included chronic schizophrenics, acute schizophrenics, outpatient schizophrenics, acute nonschizophrenic psychiatric patients and normal controls. Each patient group is more fully described below:

Chronic schizophrenics - in this study, "chronic" referred to a patient who had been continuously hospitalized for at least 4 months. As the average duration of hospitalization for first admission schizophrenics in these units had been found to be 47 days (Krumm, 1972), the assumption was made that this group could be thought of as more severely ill than the acute group. These patients were also considered to be chronic by the medical personnel as demonstrated by their placement in "maintenance" or long term wards.

Acute schizophrenics - "acute" referred to a patient who was interviewed within 2 days of admission; this was either a first admission or a readmission for reasons of disturbance rather than administration. For example, a patient readmitted after 12 months' "leave of absence" was not included in the study. This acute group comprised consecutive admissions to the units described previously.

Outpatient schizophrenics - these patients were drawn from consecutive attenders at 3 outpatient clinics attached to the source units. They were presumed to be less severely ill as they

were selected on the basis of not having been hospitalized for at least 1 year prior to the study. As community services in the province are not well developed, it seemed reasonable to assume that these outpatients were in a state of remission, rather than being actively treated outside of a hospital.

Acute nonschizophrenic psychiatric patients - this group comprised any other consecutive admissions to the hospitals, within the constraints described earlier. Their ward diagnoses were predominantly depression, personality disorder and neurosis.

Diagnoses of the chronic and outpatient schizophrenic groups were based on file information, which is customary in schizophrenia research, although not ideal (Cancro, 1969; Rosen et al, 1971). Allocation to the acute schizophrenic or acute nonschizophrenic psychiatric group was based on a modified and abbreviated form of the Present State Examination (Carpenter, 1976). Each newly admitted patient was rated on this Interview Schedule by the admitting psychiatrist (see Appendix B3). For these two groups (the acutes), it was arranged that the rating form part of the initial routine assessment of the patient, whereas with the chronic and outpatient schizophrenics, the rating would have required re-examination of the patients. Given the time and work pressures of state psychiatrists, this more desirable method of diagnosis was not possible.

The Present State Examination is based on the British Glossary (Hogarty, 1977) and is a guide to structuring the clinical psychiatric interview. It was originally developed by Wing et al (Sartorius, 1974) and has gone through a number of editions and modifications, the most notable of which was developed during the course of the International Pilot Study of Schizophrenia (Carpenter et al, 1976; Keith et al, 1976). In this transcultural investigation, involving 9 countries and 1 202 patients, the 12 most discriminating signs of schizophrenia (marked by presence or absence) were isolated. The discriminating power of these symptoms were checked on two subsequent samples, the results of

which are given below (Carpenter, 1976), in Table 8.

TABLE 8 - THE DISCRIMINATING POWER OF CARPENTER'S SIGNS AND SYMPTOMS OF SCHIZOPHRENIA (1976, p.174)

	Percentage of patients with the following number of signs		
	5 or more	6 or more	7 or more
COHORT A			
Schizophrenics (n = 407)	80	66	44
Nonschizophrenics (n = 152)	13	4	1
COHORT B			
Schizophrenics (n = 404)	81	63	39
Nonschizophrenics (n = 156)	22	6	1

One could therefore expect 80% of acute schizophrenics to have at least 5 of these symptoms. If a patient with 5 or more of these symptoms was assigned automatically to a schizophrenic category, one would expect about 13% of diagnosed nonschizophrenics to be assigned to schizophrenic groups. Five was the cut-off point used in the present study and the resulting classification was checked against the ward diagnosis. Disagreement occurred in only 2 of the 80 cases examined. In both these cases, assignment to a group was based on the Interview Schedule in order to retain consistency in diagnosis. As Stephens (1978) argued "whether we use the diagnostic criteria of Schneider (1959), Spitzer et al (1975) or the St. Louis School (Feighner et al, 1972) is less important than our using some set of clearly defined criteria" (p.29).

A number of diagnostic schemes, appropriate for research, are available, including those of Fish (1969), Feighner et al (1972), Forrest & Hay (1973) and Tsuang et al (1976). However, as pointed out earlier, some of these schemes are contaminated by

life-history material likely to bias the patient selection towards process schizophrenics. As the study aimed to examine both process and reactive schizophrenics, such diagnostic schemes were regarded as unsuitable.

Medication - all the chronic and outpatient schizophrenics were receiving maintenance doses of phenothiazines. Only some of the acute patients were already on medication by the time they were admitted. As medication was unlikely to affect the kind of assessment that was made of each patient, this imbalance amongst the patients was regarded as acceptable (Mc Creary, 1974). For the information processing study, however, attempts were made to control this variable (see Chapter 10).

5.6.2 Demographic Information

The age, education, marital status and I.Q. of each subject was recorded. In the case of admitted patients, an I.Q. test formed part of the routine psychometric evaluation and was therefore readily available. The scores for the normal controls were provided by the personnel department of the South African Railways. The scores for the outpatient schizophrenics were obtained from their performance on the Standard Progressive Matrices (Raven, 1958). Initially it was hoped that the social class of each patient could be assessed, particularly considering the important interaction effects between measures of social competence and socioeconomic status (Higgins & Peterson, 1966), and the findings of some studies, indicating that low social class patients are more often classified as process (Allon, 1971). However, practical problems prevented inclusion of this variable. In line with the "drift hypothesis", social class measures obtained from patients have been found to be lowered by poor premorbid adjustment (Magaro, 1967). It has been recommended, therefore, that measures of socioeconomic status be based on information for fathers of patients. As the units from which the samples were drawn serve the entire region of Natal, parents were mostly inaccessible. In addition, the paucity of relevant data in

hospital files would have made an accurate assessment of this variable impossible.

5.6.3 Prognostic Indices

Age at first hospitalization - this was used to approximate age of onset, following Tsuang et al (1976). The prognostically favourable impact of later onset was clearly recognized by Bleuler when he said ".... the immature psyche is far more damaged by the disease process than is the more mature psyche of the adult" (1911, p.241). Although there was a period in psychiatric history when the contrary was believed true (Blair, 1940), a number of studies have confirmed Bleuler's observation (for example, Astrup et al, 1966; Harrow et al, 1973). Keith et al (1976) speculated that the seeming negative prognostic significance of earlier age of onset was probably related to the individual lacking training and therefore being unemployable at higher levels. It is equally possible that this variable is disease-related and indicative of severity of illness. Although age at first hospitalization is a crude approximation of age of onset, it is customarily employed in schizophrenia research and it is probably true that "the difficulty in accurately estimating age of onset seems to be inherent in the character of the variable itself" (Turner & Zabo, 1968, p.45).

Total number of months of previous hospitalization, number of previous admissions and average length of stay per admission - there is a considerable body of data already quoted which indicates that length of previous hospitalization is a good predictor of prognosis (Ward & Carlson, 1966; Meichenbaum, 1969; Affleck, 1975). Although there are exceptions to these findings (for example, Harrow et al, 1969), the evidence indicates that previous hospitalization must be incorporated into any prediction of prognosis. Hospital files, as well as interview material, were used to obtain these measures of hospitalization experience.

Precipitating Factors - very few studies describe in detail how

this variable was estimated. In the preliminary investigation it became apparent that most patients believed there were external factors related to the onset of their disorder. In the present study, direct questions to this effect were avoided and the presence or absence of such factors was subjectively judged on the basis of extensive questioning of the patient about the period prior to hospitalization. Difficulties in operationalizing this variable would appear to render it less useful than other prognostic indicators.

Family history of psychiatric disorder - the importance of a family history of either schizophrenia or affective disorder has been stressed previously. However, accurate identification of the diagnoses of all treated relatives would have required either extensive follow-up resources or extremely detailed and accurate hospital files. As neither of these were available, Orzack & Kornetsky's (1971) method was used. A positive score was assigned if mental illness was known to be present in the immediate family, as well as aunts, uncles, grandparents, etc. The acceptable categories were schizophrenia, alcoholism, depression, paranoia, manic-depression and suicide. This crude measure could be derived from files and from interview material. Using this method, Astrup et al (1966) found only 8% disagreement between two independent raters. Although a number of studies have not been able to establish a prognostic relationship with such a crude measure (Klaf & Hamilton, 1961; Mednick, 1973), Asarnow (1974) found that process and paranoid patients came from families with a higher incidence of psychiatric disorder.

Confusion - although the positive prognostic significance of confusion during the acute episode has been continually emphasized (for example, Zubin et al, 1961), very few studies describe the assessment of this variable. In the present study, the report on the mental status of the patient written by the admitting psychiatrist was used to determine the presence or absence of confusion on admission.

An important prognostic indicator omitted from the present study was acute versus gradual onset of schizophrenia. Despite numerous assertions of its value in predicting outcome (Blair, 1940; Zubin et al, 1961; Astrup et al, 1966; Harrow et al, 1969; Bromet et al, 1974; Forrest, 1975), the author could find no study which had resolved the difficulties posed by the measurement of this variable. In addition, a number of authors have pointed out that this indicator is limited by the difficulties inherent in estimating it (Zubin & Spring, 1977; Shean, 1978). Neale & Cromwell (1972) make the point that the time at which psychotic symptoms begin would often be a matter of subjective judgement by unsophisticated observers, that is, the patient's family.

5.6.4 Paranoid Status

In the chronic and outpatient schizophrenic groups positive paranoid status was recorded if the file diagnosis included paranoia. This practice is routine in most studies (for example, Silverman, 1967; Eisenthal et al, 1972; Goldstein & Halperin, 1977). Some of the patients in these two groups had long psychiatric histories and had received a number of different subdiagnoses of schizophrenia, tending with time, to be increasingly labelled "chronic undifferentiated". In this study, patients in the chronic and outpatient groups were recorded as being paranoid if, at any time, they had been diagnosed as paranoid schizophrenic. In the acute group, a diagnosis of paranoia was based on an affirmative answer, by the admitting psychiatrist, to item 12 of the Interview Schedule ("the presence of widespread delusions"). In all such cases it was found that the patient was recorded as being paranoid in the ward file as well.

5.6.5 Prognosis

In Chapter 4 it was pointed out that the importance ascribed to the process-reactive distinction was based on its presumed relationship to prognosis. However, the assessment of prognosis remains problematic, and Strauss & Carpenter (1972) have argued that it should be based, ideally, on measures of hospitalization, social

functioning, employment status and symptom remission. Nonetheless, most studies use length of index hospitalization as the measure of prognosis (Zubin & Spring, 1977); accepting that such an index can be affected by situational parameters independent of a patient's mental state (Turner & Zabo, 1968; Schooler et al, 1971). Meichenbaum (1969) and Harrow et al (1969) have, moreover, demonstrated that predictors of shorter hospitalization are also the factors indicative of good post-hospital adjustment.

For the chronic and acute schizophrenic groups, and the group of acute nonschizophrenic psychiatric controls, prognosis was assessed, following Cancro (1969), by the patients' hospital status at the end of a follow-up period. The measure of prognosis used was the number of months of continued hospitalization from the beginning of the index hospitalization until the follow-up assessment. For the chronic group the follow-up period was 24 months, and for the two acute groups, 18 months.

An acceptable index of outcome for the outpatient group of schizophrenics presented a number of difficulties. Symptomatic indices appeared inappropriate as, having remained out of a hospital for 1 year, the assumption of the patients being relatively symptom-free seemed reasonable. A comprehensive assessment of social functioning of each of the 40 patients would have been beyond the practical capabilities of the investigator. For these reasons, a 3-point rating of employment status was eventually used: a rating of 1 referred to a patient who was employed in the job category for which he was trained; 2 for a patient who was employed in a lower level job or by a sheltered employment facility and 3 for a patient who was unemployed and receiving a disability grant, or being supported by his family.

5.6.6 Method

All subjects were informed of the purpose of the interviews and that participation in the study was voluntary. Except for the 3 patients in the preliminary investigation, no other subjects

refused to co-operate with the study. In the case of the outpatient and chronic groups, the investigator was aware, prior to the interviews, that the patients were diagnosed schizophrenics. In the case of the acute patients, however, the patients were interviewed blind, that is prior to their assignment to either a schizophrenic or nonschizophrenic psychiatric group.

5.6.7 Evaluation

There were a number of shortcomings in the method of the process-reactive study: the lack of defined diagnostic criteria for the outpatient and chronic schizophrenic groups, the absence of an assessment of social class, the subjective nature of the assessment of precipitating factors and the different outcome criterion for outpatient schizophrenics. In the opinion of the investigator, none of these problems could have been avoided. Attention is directed towards them on the basis of the conclusion reached by Cash (1973) concerning "the admission of difficulties encountered that necessitated following procedures which are less adequate than those recognized as desirable. The explicit elaboration of such resultant procedures is perhaps the most significant step in providing the readers with a basis for determining the degree of confidence to be placed in the results and interpretations" (p.285).

S E C T I O N T W O

CHAPTER 6 - RESULTS OF THE PROCESS-REACTIVE STUDY

SECTION TWO

CHAPTER 6 - RESULTS AND DISCUSSION

Although brief comments accompany the results as they are given, general conclusions and implications will be dealt with in Chapter 7. The raw data, on which the subsequent analyses are based, are given in Appendix A, II-VII; the summary tables for the analyses of variance are given in Appendix A, VIII.

6.1 SUBJECT CHARACTERISTICS

6.1.1 Demographic Characteristics

The age, number of years of education received, I.Q. and marital status of the five groups studied are given in Table 9 overleaf.

TABLE 9 - DEMOGRAPHIC CHARACTERISTICS OF THE TOTAL SAMPLE

(n = 40 in each group)

		Chronic Schizophrenics	Acute Schizophrenics	Outpatient Schizophrenics	Combined Schizophrenic Group (n = 120)	Acute Non-schizophrenic Psychiatric Controls	Normal Controls
AGE	$\bar{x}$	31,9	25,63	28,65	28,73	27,58	27,85
	S.D.	6,8	6,50	6,67	7,08	6,29	6,33
	Range	19-44	18-42	19-44	18-44	20-38	19-45
EDUCATION	$\bar{x}$	11,15	10,8	11,22	11,05	11,2	11,93
	S.D.	2,27	1,56	1,62	1,85	1,96	1,38
	Range	8-18	8-15	8-14	8-18	8-16	10-16
I.Q.	$\bar{x}$	98,98	100,18	99,22	99,46	100,80	106,0
	S.D.	14,65	11,43	10,99	11,72	11,99	8,71
	Range	80-138	80-124	80-118	80-138	80-130	93-129
Marital Status	%	27,5	27,5	25,0	26,5	50,0	60,0
	f	11	11	10	31	20	24

One-way analyses of variance were computed for the age, education and I.Q. data.

Age - There was a significant difference in the mean ages of the five groups ($F = 4,89$; $df = 4,195$; $p<0,01$). Pairwise comparisons (Tukey's HSD), showed that the chronic schizophrenic group was significantly older than the other four groups.

Education - There were no significant differences between the groups in terms of the mean number of years of education each had received ($F = 2,12$; $df = 4,195$).

I.Q. - There were no significant differences between the groups in terms of I.Q. ($F = 2,28$; $df = 4,195$).

Marriage - Chi-squared analyses showed that there was a significant difference in the proportion of married individuals in the different groups (χ^2 = 17,39; df = 4; p<0,01); the two control groups being significantly more likely to be married than the three schizophrenic groups, as assessed by a chi-squared test of the difference between the combined groups (χ^2 = 16,68; df = 1; p<0,01).

6.1.2 Hospitalization Experience

The patterns of hospitalization of each patient group, prior to the study, are given in Table 10 overleaf.

TABLE 10 - HOSPITALIZATION EXPERIENCE OF THE PATIENT GROUPS (n = 40 in each group)

		Chronic Schizophrenics	Acute Schizophrenics	Outpatient Schizophrenics	Combined Schizophrenic Group (n = 120)	Acute Nonschizophrenic Psychiatric Controls
Age at first hospitalization	$\bar{x}$	23,68	22,35	21,51	22,56	24,20
	S.D.	5,34	6,48	5,58	5,86	6,56
	Range	16-38	15-41	16-38	15-41	16-38
Total number of months of previous hospitalization	$\bar{x}$	45,70	6,69	13,61	21,66	3,35
	S.D.	49,34	10,49	13,71	34,54	5,32
	Range	4-223	0-49	2-64	0-223	0-22
Total number of previous admissions	$\bar{x}$	3,2	2,18	3,11	2,74	1,4
	S.D.	1,51	2,32	1,71	1,95	1,78
	Range	1-7	0-10	0-8	0-10	0-6
Average length of stay per admission (months)	$\bar{x}$	18,79	2,51	4,55	8,25	1,49
	S.D.	25,28	1,66	5,24	16,62	2,65
	Range	1,25-111,5	0-5,3	0-32	0-111,5	0-12

One-way analyses of variance were calculated for each of the four indices of hospitalization experience.

Age at first hospitalization - there was a significant difference between the groups at the 5% but not at the 1% level ($F = 3,36$; $df = 3,156$). Pairwise comparisons showed that the chronic and psychiatric groups had been hospitalized for the first time at a later age than the outpatient schizophrenic group. No other comparisons were significant.

Total number of months of previous hospitalization - a significant difference between the groups was found ($F = 21,9$; $df = 3,156$; $p<0,01$). Pairwise comparisons showed that the chronic schizophrenic group had spent significantly longer periods in hospital than any of the other three patient groups.

Total number of previous admissions - a significant difference between the groups was found ($F = 7,19$; $df = 3,156$; $p<0,01$). Pairwise comparisons showed that both the chronic and outpatient schizophrenic groups had been admitted to institutions more frequently than the acute schizophrenic group. No other comparisons were significant.

Average length of stay per admission - a significant difference between the groups was found ($F = 16,08$; $df = 3,156$; $p<0,01$). Pairwise comparisons showed that the chronic schizophrenic group had spent a significantly longer period in hospital at any one time than any of the other three groups.

6.1.3 Presenting Signs of the Disorder

The frequencies of presenting signs such as precipitating factors, a family history of psychiatric disorder, confusion on admission, paranoia and drug status on admission are given in Table 11 overleaf.

TABLE 11 - PRESENTING SIGNS OF THE PATIENT GROUPS

(n = 40 in each group)

		Chronic Schizophrenics	Acute Schizophrenics	Outpatient Schizophrenics	Acute Nonschizophrenic Psychiztric Controls
Precipitating Factors	%	20,0	27,5	22,5	37,5
	f	8	11	9	15
Family History of Psychiatric Disorder	%	38,5	17,5	27,5	42,5
	f	15	7	11	17
Confusion on Admission	%	30,0	22,5	25,0	7,5
	f	12	9	10	3
Paranoid Diagnosis	%	42,5	30,0	40,0	0,0
	f	17	12	16	0
Medication	%	100,00	57,5	100,00	45,0
	f	40	23	40	18

Chi-squared tests revealed that there were no significant differences between the groups in the frequency of precipitating factors ($\chi^2 = 3,65$; df = 3), family history of psychiatric disorder ($\chi^2 = 6,87$; df = 3) or confusion on admission ($\chi^2 = 6,72$; df = 3). There was no difference between the three schizophrenic groups in the proportion of individuals diagnosed as paranoid ($\chi^2 = 1,49$; df = 2). In addition it should be noted that 30% of the acute schizophrenic group and 45% of the psychiatric control group were first admission patients.

Summary - The five groups studied did not differ in I.Q. or the number of years of education received. The majority of subjects could be described as belonging to social class IV. A smaller proportion of married individuals in schizophrenic samples has been well documented (for example, Turner et al, 1970) and was to be expected. Although the older age of the chronic group was undesirable, it does not appear as if their longer hospitalization history could be attributed to their age; despite their significantly later age of onset, they had spent more time in hospitals and tended to stay in hospital for a longer period each time they were admitted. The patient groups did not differ on presenting signs, such as the presence of precipitating factors, family history of psychiatric disorder or confusion on admission, and there was a comparable number of paranoid and nonparanoid patients in each of the schizophrenic groups. In conclusion, the subjects were generally equivalent on a number of demographic and psychiatric variables.

6.2 THE NATURE OF THE PROCESS-REACTIVE DIMENSION

In Chapters 4 & 5, four possible interpretations of the process-reactive dimension were outlined. Results pertinent to each of these interpretations will be presented separately in the following sections.

6.2.1 Two Separate Disorders

As outlined previously, the following findings would corroborate the view that process-reactive represents a division between two categories of disorders:

- different symptom patterns among process and reactive schizophrenics,
- a clear dichotomy, rather than a continuum of process-reactive scores,
- differential ages of onset and patterns of hospitalization among process and reactive patients, corresponding to the disorders schizophrenia and affective psychoses, respectively.

Symptom patterns among process and reactive schizophrenics - As mentioned in the previous chapter, symptom patterns could only be obtained for the acute schizophrenic and the acute nonschizophrenic control groups (these are given in Appendix A, VII). The symptom patterns of process and reactive patients in these two acute groups are given in Table 12 below.

TABLE 12 - SYMPTOM PATTERNS OF PROCESS AND REACTIVE PATIENTS IN THE ACUTE SCHIZOPHRENIC AND ACUTE NONSCHIZOPHRENIC GROUPS

Symptom	Acute Schizophrenics		Acute Nonschizophrenic Psychiatrics	
	Process (n = 22)	Reactive (n = 18)	Process (n = 16)	Reactive (n = 24)
1. Restricted Affect *+	14	10	4	3
2. Preoccupied, inattentive	11	4	1	6
3. Poor insight *+	19	18	3	2
4. Denies delusions though present	5	9	1	0
5. Thoughts aloud *+	7	5	0	0
6. Auditory hallucinations	10	5	6	1
7. Waking early *-	21	17	12	13
8. Apathy	11	5	2	5
9. Depressed facies *-	18	14	10	13
10. Stereotypic	0	3	0	0
11. Elation *-	20	15	16	24
12. Widespread delusions *+	4	8	0	0
13. Thought withdrawal	6	3	3	1
14. Incoherent speech *+	1	1	0	0
15. Irrelevance	6	12	1	0
16. Unreliable information *+	18	8	10	8
17. Bizarre delusions *+	4	6	0	0
18. Neologisms	0	0	0	0
19. Nihilistic delusions *+	1	0	0	0
20. Poor rapport *+	5	3	0	1

* The presence (+) or absence (-) of these symptoms are regarded as

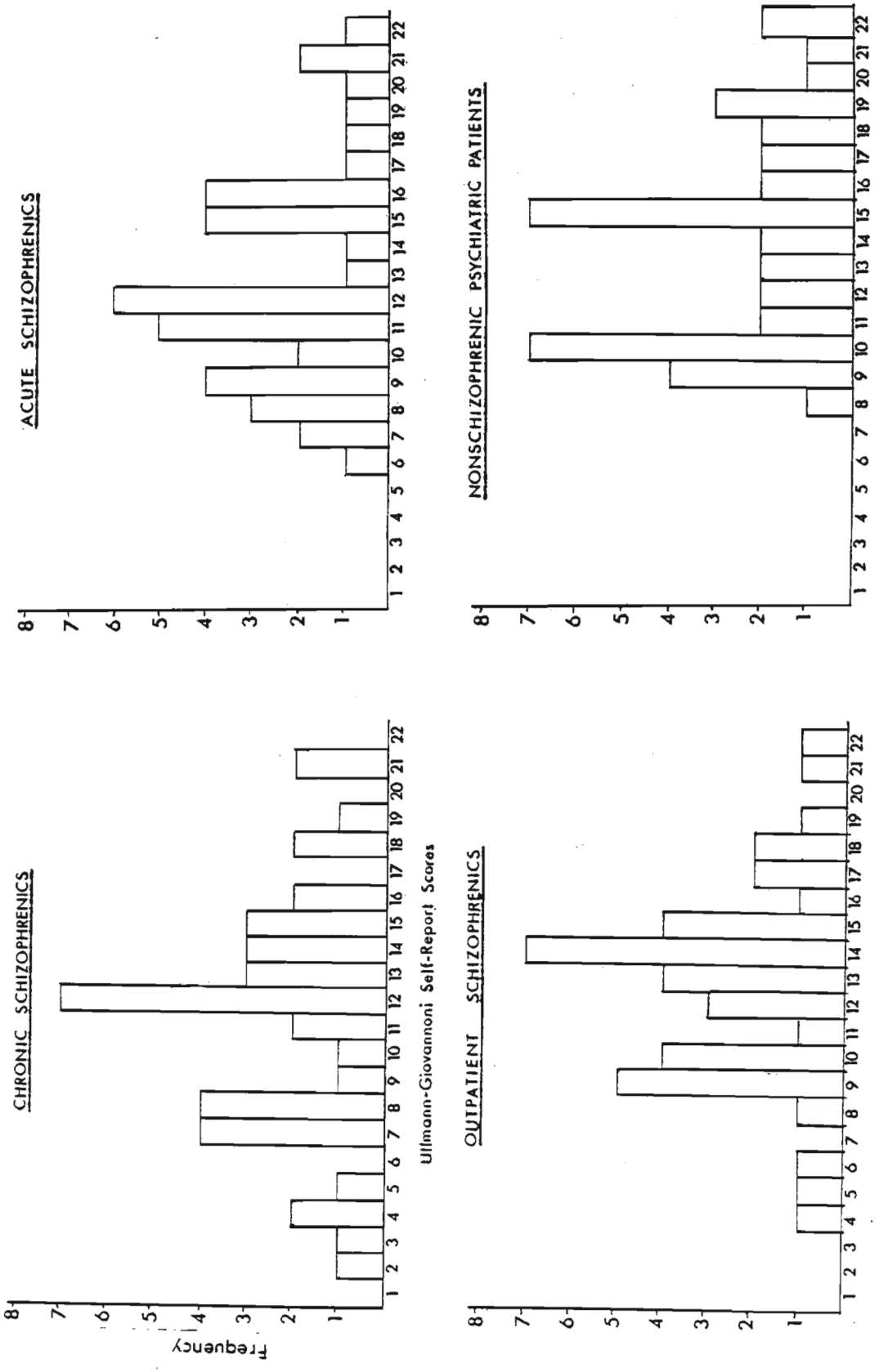
Differences in the proportions of particular symptoms between the process and reactive patients were assessed by means of Chi-squared tests, or Fisher Exact Probability Tests when the size of expected frequencies abrogated the assumptions of Chi-squared analysis. Among process and reactive schizophrenics, the only significant difference found was on symptom 16, Unreliable Information ($\chi^2 = 4{,}60$; $df = 1$; $p<0{,}05$). There were no significant differences between process and reactive patients in the psychiatric control group.

Process and reactive patients do not therefore appear to differ in their symptom presentation, a finding contrary to the notion that process and reactive schizophrenia are separate disorders, the latter being a variant of the affective psychoses.

A dichotomy versus a continuum of process-reactive scores - Only two studies appear to have published the actual frequencies of the process-reactive scores obtained by the samples studied (Wittman, 1941; Chapman, Day & Burstein, 1961). Wittman claimed to have found a completely bimodal distribution of scores, a finding since attributed to rater bias. Despite the lack of published data, the majority of authors assert that the dimension is a continuous one (for example, Becker, 1959; Strauss & Carpenter, 1978).

The distributions of process-reactive scores in the four patient groups in this study are given in Figure 2 overleaf.

Figure 2 - The Distribution of Process-Reactive Scores in the Four Patient Groups



Chi-squared tests for goodness of fit to a normal distribution were computed for each of the four distributions: chronic schizophrenics (χ^2 = 23,11), acute schizophrenics (χ^2 = 24,14), outpatient schizophrenics (χ^2 = 23,51) and acute psychiatric controls (χ^2 = 25,69). Three of the distributions were shown not to be normal (χ^2 23,21; df = 10; $p<0,01$); at the same time, inspection of the histograms does not lead to the conclusion that the scores cluster in a clearly bimodal manner, as found, for example, by Wittman (1941).

Age of onset and patterns of hospitalization - When it is argued that process and reactive schizophrenia are separate and different disorders, the reactive group is seen to be associated with the affective disorders and not with schizophrenia. If this were so, it would seem reasonable to assume that reactive schizophrenics would be more similar to the affective disorders on descriptive indices such as age of onset and patterns of hospitalization. Process patients, on the other hand, would be more like schizophrenics on such indices. Clear differences between schizophrenia and the affective disorders have been found; earlier ages of onset and longer periods of institutionalization are particular to schizophrenia (Salzinger, 1973; Shean, 1978). A previous study of 167 patients from the same hospitals from which the present samples were drawn showed that the average age of first hospitalization of schizophrenics was 29,5 years while for manic-depressives it was 46 years. The average length of hospital stay per admission for schizophrenics was 47 days, whereas for manic-depressives it was 37 days (Krumm, 1973).

In the context of the present study, one could therefore expect reactive schizophrenics to be more like the mixed psychiatric group than the process schizophrenic group on such descriptive indices. The age of onset and patterns of previous hospitalization of process and reactive patients in the four psychiatric groups are given in Table 13 overleaf.

TABLE 13 - AGE OF ONSET AND PREVIOUS HOSPITALIZATION OF PROCESS AND REACTIVE PATIENTS

		Chronic Schizophrenics		Acute Schizophrenics		Outpatient Schizophrenics		Psychiatric Controls	
		Process (n = 24)	Reactive (n = 16)	Process (n = 23)	Reactive (n = 17)	Process (n = 17)	Reactive (n = 23)	Process (n = 16)	Reactive (n = 24)
Age of onset	$\bar{x}$	23,04	24,63	20,61	24,71	20,27	22,36	19,50	27,33
Length of previous hospitalization (months)	$\bar{x}$	61,67	21,75	6,77	6,59	15,53	12,29	6,88	1,79
Average length of stay per admission (months)	$\bar{x}$	26,67	6,98	1,88	1,63	6,46	3,25	2,27	0,98

Two-way analyses of variance were computed for each of the three indices (the method of unweighted means for unequal sample sizes):

Age of onset - Process patients had a significantly earlier age of onset than reactive patients across all four diagnostic categories ($F = 18,54$; $df = 1,152$; $p<0,01$). The interaction between process-reactive grouping and diagnostic category was not significant ($F = 2,73$; $df = 3,152$; $p<0,01$).

Length of previous hospitalization - The interaction between diagnostic categories and the process-reactive dimension was found to be significant ($F = 5,50$; $df = 3,152$; $p<0,01$). Calculation of the simple main effects of the interaction showed that process chronic patients had had a significantly longer history of hospitalization than reactive chronic schizophrenics ($F = 24,83$; $df = 1,152$; $p<0,01$). There were no other significant effects.

Average length of stay per admission - There was a significant interaction between diagnostic category and the process-reactive dimension ($F = 5,31$; $df = 1,152$; $p<0,01$). Analysis of the simple main effects of the interaction showed that process chronic patients had spent a significantly longer time in hospital each time they were admitted than reactive chronic schizophrenics ($F = 24,69$; $df = 1,152$; $p<0,01$). There were no other significant effects.

The significant difference between process and reactive patients in age of onset was found across both the schizophrenic groups and the psychiatric control group. Only in the chronic schizophrenic group were significant process-reactive differences found on measures of prior hospitalization patterns. In general, the findings do not suggest that reactive schizophrenics are more like other psychiatric patients in terms of age of onset and hospitalization patterns.

Conclusion - Asserting a disease split between the process and reactive categories, corresponding to the split between schizophrenia and the affective disorders requires that a useful and meaningful

distinction can be made between the two major functional psychoses; some doubts about this were raised in Chapter 4. The present study indicated that process and reactive patients could not be distinguished symptomatologically; there was some ambiguity regarding the bimodality of process-reactive scores such that there were no clear indications of two separate groups; lastly, the analyses of age of onset and prior hospitalization experience did not confirm a close relationship between reactive schizophrenics and psychiatric patients. On the basis of these findings, it seems unlikely that process and reactive schizophrenia are separate disorders, reactive being a variant of affective disorder and process representing a "nuclear" or "core" schizophrenic group.

6.2.2 Severity

One interpretation that has been placed on the process-reactive dimension is that it represents a categorization of patients based on the severity of the disorder. The concept of severity is ambiguous when applied to functional disorders, but will be used here to refer to actual or potential recovery or assessed number of symptoms; that is, more severely ill patients are those who are least likely to recover and/or who are seen to present a greater number of symptoms. In the context of the present study, an interpretation of severity underlying the process-reactive dimension would be corroborated by findings of:

- graded versus differential performance by process and reactive schizophrenics on cognitive tasks (an assessment of this was incorporated into the second part of this study and will therefore not be dealt with here);
- different process-reactive patterns in groups of patients distinguished from each other by severity;
- different ratings of the number of symptoms presented by process and reactive patients.

Process-reactive patterns in groups of schizophrenics distinguished by severity - If potential for recovery is accepted

as one criterion of severity, then nonschizophrenic psychiatric patients can be seen to be less severely ill than schizophrenics. By the same token, the outpatient schizophrenic group, as a whole, can be seen to be less severely ill than the chronic schizophrenic group; acute schizophrenics could conceivably vary in their potential for recovery. If this is the case, and if the process-reactive dimension is a dimension of severity only, then the numbers of process and reactive patients in the various groups should vary in accordance with this standard of severity. The proportions of process and reactive patients in the four psychiatric groups is given in Table 14 below.

TABLE 14 - THE PROPORTION OF PROCESS-REACTIVE INDIVIDUALS IN THE FOUR PATIENT GROUPS (n = 40 in each group)

	Chronic Schizophrenics	Acute Schizophrenics	Outpatient Schizophrenics	Psychiatric Controls
Process	24	22	17	16
Reactive	16	18	23	24

Although the computed Chi-squared revealed no significant difference in the proportion of process and reactive patients in the four groups ($\chi^2 = 4{,}48$; df = 3), there was clearly a trend towards a greater number of process patients in the chronic schizophrenic group and a smaller number in the psychiatric control group.

Rated number of symptoms in process and reactive patients - With number of symptoms as a standard of severity, one would expect process patients to be rated as having more symptoms than reactive patients, irrespective of whether these symptoms are regarded as pathognomic of schizophrenic. This data was only available for the two acute groups, schizophrenics and psychiatric controls, and is given in Table 15 overleaf.

TABLE 15 - TOTAL NUMBER OF SYMPTOMS RATED AS PRESENT IN PROCESS AND REACTIVE ACUTE SCHIZOPHRENICS AND PSYCHIATRIC CONTROLS

	Acute Schizophrenics		Acute Psychiatric Controls	
	Process (n = 22)	Reactive (n = 18)	Process (n = 16)	Reactive (n = 24)
Mean number of symptoms checked as present	5,86	6,00	2,63	1,96

A two-way analysis of variance (unweighted means) showed that there was a significant difference in the number of symptoms rated to be present in schizophrenics and psychiatric controls ($F = 65,75$; $df = 1,76$; $p<0,01$). There were no significant differences between process and reactive patients in the two diagnostic groups.

Conclusion - On the basis of the present findings it seems unlikely that severity alone can account for process-reactive differences. There were as many reactive patients in the chronic schizophrenic group as in all the other patient groups, and process patients were not assessed as demonstrating a greater number of symptoms than reactive patients. The view that process patients are simply "more ill" than reactives would appear to require further specification of what constitutes severity in functional disorders.

6.2.3 Social Competence

The theory that a general social competence dimension underlies process-reactive differences would be corroborated by findings of:

- different patterns of social competence indices amongst process (less competent) and reactive (more competent) patients;
- a relationship between process-reactive ratings and prognosis in psychiatric groups other than schizophrenics.

Social competence indices in process and reactive patients - The three indices of social competence assessed in this study were marital status, I.Q. and education.

Marriage - The marital status of the five groups included in the study, as well as the process-reactive breakdown in the patient groups, is given in Table 16 below.

TABLE 16 - PROPORTIONS OF MARRIED AND SINGLE INDIVIDUALS AMONG SCHIZOPHRENICS, PSYCHIATRIC CONTROL PATIENTS AND NORMALS

Group	Single	Married
Chronic Schizophrenics	29	11
Process	23	1
Reactive	6	10
Acute Schizophrenics	29	11
Process	21	2
Reactive	8	9
Outpatient Schizophrenics	30	10
Process	16	1
Reactive	14	9
Psychiatric Controls	20	20
Process	15	2
Reactive	5	18
Normals	16	24

The proportion of married to single individuals in the combined process and reactive groups was tested by means of Chi-squared; single individuals were more likely to be classified as process; whereas married individuals were more likely to be classified as reactive ($\chi^2 = 47,09$; $df = 1$; $p<0,01$).

I.Q. - As indicated earlier in this chapter (see Table 9), there were no significant differences in I.Q. between the five groups. The process-reactive breakdown in terms of I.Q. is given in Table 17 below.

TABLE 17 - I.Q. DIFFERENCES BETWEEN PROCESS AND REACTIVE SCHIZOPHRENICS AND PSYCHIATRIC CONTROLS

	Chronic Schizophrenics		Acute Schizophrenics		Outpatient Schizophrenics		Psychiatric Controls	
	Process (n = 24)	Reactive (n = 16)	Process (n = 22)	Reactive (n = 18)	Process (n = 17)	Reactive (n = 23)	Process (n = 16)	Reactive (n = 24)
I.Q. $\bar{x}$	94,70	105,38	99,04	101,71	96,76	101,04	96,25	103,83
S.D.	13,34	14,57	10,76	12,44	9,85	11,65	13,12	10,38

A two-way analysis of variance (unweighted means) indicated that there was a significant difference in I.Q. between process and reactive patients ($F = 10,71$; $df = 1,152$; $p<0,01$). There were no other significant effects.

Education - Findings reported earlier (see Table 9) demonstrated that there were no significant differences in the number of years of education each of the five groups had received. The process-reactive subdivisions in terms of education are given in Table 18 overleaf.

TABLE 18 - EDUCATIONAL DIFFERENCES BETWEEN PROCESS AND REACTIVE SCHIZOPHRENICS AND PSYCHIATRIC CONTROLS

		Chronic Schizophrenics		Acute Schizophrenics		Outpatient Schizophrenics		Psychiatric Controls	
		Process (n = 24)	Reactive (n = 16)	Process (n = 22)	Reactive (n = 18)	Process (n = 17)	Reactive (n = 23)	Process (n = 16)	Reactive (n = 24)
Education	$\bar{x}$	10,63	11,88	10,57	11,12	10,94	11,43	10,69	11,54
	S.D.	1,91	2,66	1,31	1,83	1,43	1,75	2,33	1,64

A two-way analysis of variance (unweighted means) indicated that there was a significant difference in education between process and reactive patients ($F = 6,92$; $df = 1,152$; $p<0,01$). There were no other significant effects.

With marriage, I.Q. and education as indices of social competence, reactive patients were found to be significantly more socially competent than process patients; this finding held regardless of diagnostic grouping.

The relationship between process-reactive rating and prognosis in nonschizophrenic psychiatric patients - The product-moment correlation between Ullmann Scale scores and length of index hospitalization on 18-month follow-up, for the psychiatric control group, was not significant ($r = 0,13$; $df = 38$). There was therefore no significant relationship between process-reactive rating and prognosis in the psychiatric control group.

Conclusion - The view that the process-reactive dimension has its foundation in social competence is based on two assumptions, both of which give rise to testable predictions. Firstly, process-reactive measures are seen to be assessments of social competence; that is, reactive patients are more socially competent individuals than process patients. The present study supported this contention, with marriage, I.Q. and education as indices of social competence. Secondly, differential prognosis is held to be explicable in terms of social competence; that is, more socially competent individuals are likely to have better prognoses and vice versa. As competence is regarded as a general dimension, applicable to all individuals, it should be predictive of prognosis among psychiatric groups other than schizophrenics. In the present study no support was found for a positive relationship between process-reactive rating and prognosis in a nonschizophrenic psychiatric group.

6.2.4 Artefact of Prognostic Signs

The possibility of the process-reactive dimension having no coherent theoretical significance was raised in Chapter 4; the dimension may merely represent a summary of prognostic indices, each individual index deriving its significance from disease-related factors, social factors or treatment factors, in combination or singly. In Chapter 5 it was argued that this hypothesis would be corroborated by findings which indicated that:

- the process-reactive dimension was a robust predictor of prognosis; if the dimension incorporated most known prognosticators, it could be expected to be relatively impervious to the effects of the stage or phase of the illness;
- the process-reactive dimension had a higher correlation with outcome than any other single prognostic indicator;
- the process-reactive dimension derived its impact on prognosis from the effects of a number of prognostic signs.

The process-reactive dimension as a robust prognosticator - If the process-reactive dimension is to be seen as a summary variable, incorporating valuable, but isolated, prognostic information, it should have utility across phases of the illness, regardless of whether the state is acute, chronic or in remission. The correlations between process-reactive scores and measures of prognosis in acute, chronic and outpatient schizophrenics is given in Table 19 overleaf. For the acute and chronic schizophrenic groups the measure of prognosis was the length of index hospitalization on a follow-up assessment at 18 and 24 months respectively; for the outpatient group prognosis was assessed by a rating of present occupational status.

TABLE 19 - THE RELATIONSHIP BETWEEN PROCESS-REACTIVE SCORES AND PROGNOSIS IN ACUTE, CHRONIC AND OUTPATIENT SCHIZOPHRENICS

	Correlation
Acute Schizophrenics	$r = -0,41$ *
Chronic Schizophrenics	$r = 0,24$
Outpatient Schizophrenics	$r_s = 0,40$ *

r = Product-moment correlation coefficient
r_s = Spearman rank order correlation coefficient
* $p < 0,01$; df = 38

In both the acute and outpatient groups, the process-reactive rating correlated significantly with the prognostic measure used. However, in the chronic schizophrenic group, the correlation between process-reactive rating and length of index hospitalization was not significant. It therefore requires to be shown that, either process-reactive rating is not an appropriate predictor of prognosis in chronic groups, and that other factors are more important in determining prognosis in this group; or, that length of hospitalization is not an appropriate measure of prognosis in chronic schizophrenics. Attention will be given to these possibilities in Chapter 7.

The superiority of the process-reactive dimension as a predictor of prognosis - As has been previously demonstrated, the process-reactive dimension was not correlated with prognosis in the chronic schizophrenic group nor in the acute psychiatric group. It was, however, found to be significantly related to the prognosis of acute and outpatient schizophrenics. What requires assessment is the extent to which the process-reactive dimension improves upon the predictive effects of other prognostic signs. The correlations between traditional measures of prognosis and the outcome criteria for all four patient groups is given in Table 20 overleaf.

TABLE 20 - THE RELATIONSHIPS BETWEEN MEASURES OF PROGNOSIS AND ASSUMED PROGNOSTIC SIGNS

	Marital Status	Age at First Hospitali-	Total Months Previous Hospitali-zation	Precipitating Factors	Family History	Confusion	Ullman Score
Acute Schizophrenics	$r_{pbi} = -0,28$	$r = -0,19$	$r = 0,48^*$	$r_{pbi} = -0,02$	$r_{pbi} = 0,12$	$r_{pbi} = -0,11$	$r = 0,41^*$
Chronic Schizophrenics	$r_{pbi} = -0,24$	$r = -0,02$	$r = 0,85^*$	$r_{pbi} = -0,11$	$r_{pbi} = -0,02$	$r_{pbi} = 0,08$	$r = 0,24$
Outpatient Schizophrenics	$C = 0,18$	$r_s = -0,14$	$r_s = 0,28$	$C = 0,23$	$C = 0,18$	$C = 0,24$	$r_s = -0,40^*$
Acute Non-Schizophrenics	$r_{pbi} = 0,12$	$r = 0,02$	$r = 0,52^*$	$r_{pbi} = -0,07$	$r_{pbi} = -0,15$	$r_{pbi} = -0,007$	$r = 0,13$

C = Contingency coefficient
r = Product-moment correlation coefficient
r_{pbi} = Point biserial correlation coefficient

* 0,01 level of significance

Although the contingency coefficients calculated for the outpatient group, are not comparable to the other correlation coefficients, they are included in the table for illustrative purposes.

Of all the traditional prognostic signs, only length of previous hospitalization (in all but the outpatient group) was found to be significantly related to prognosis. Therefore length of previous hospitalization was the only index which correlated significantly with prognosis in the chronic schizophrenic and acute psychiatric groups. In the acute schizophrenic group, both length of previous hospitalization and process-reactive rating were significantly correlated with prognosis. A test for the significance of difference between the two correlations revealed no such difference ($Z = 0,38$; $df = 38$). No support was therefore found for the contention that the process-reactive dimension is a better predictor of prognosis than any other single sign in different groups of schizophrenics.

The multiple correlation coefficient, corrected for small samples, was calculated to establish the combined effects of length of previous hospitalization and process-reactive rating on prognosis. The resulting coefficients, expressed as percentages of variance, are presented in Table 21 overleaf; owing to the nature of the outcome measure used for the outpatient schizophrenics, this group has been excluded from the analysis.

TABLE 21 - THE PERCENTAGES OF VARIANCE CONTRIBUTED TO BY PREVIOUS HOSPITALIZATION AND PROCESS-REACTIVE DESIGNATION IN ACCOUNTING FOR PROGNOSIS

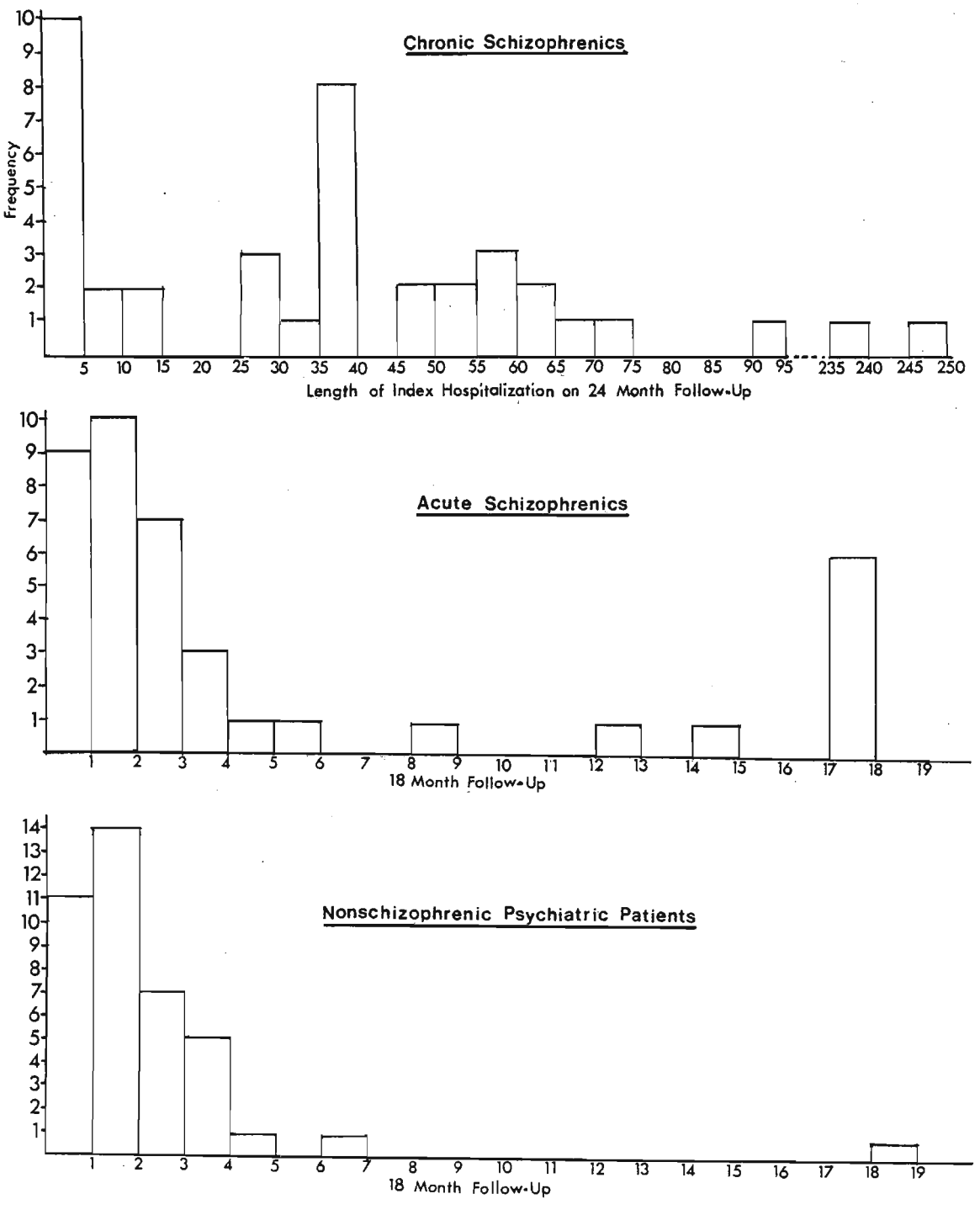
	Length of Previous Hospitalization	Process-Reactive (Ullmann Score)	Length of Previous Hospitalization + Process-Reactive
Acute Schizophrenics	23,04	16,81	28,22
Chronic Schizophrenics	72,25	5,76	72,90
Acute Nonschizophrenic Patients	27,04	1,69	23,11

The data presented in Table 21 cast doubt on the primary importance of the process-reactive dimension to the assessment of prognosis. In earlier chapters it was pointed out that the relationship between the dimension and measures of outcome has been offered as an important justification for the validity of the distinction between process and reactive schizophrenics. In Chapter 4, material was presented which illustrated that previous writers had assumed a dichotomization of schizophrenics in terms of outcome, that is, good and poor prognosis, and that the process-reactive dimension was seen to be synonymous with such a division (see Table 2 and 3). In this study, process-reactive ratings were significantly related to prognosis in acute and outpatient schizophrenics; however, when compared with other prognostic indicators, it could be seen that process-reactive ratings did not inevitably correlate most highly with prognosis.

Furthermore, simplistic notions of a dichotomy in outcome, resulting in good and poor prognostic groups, may be unwarranted. The distributions of outcome scores, the number of months of

index hospitalization on follow-up, for the two acute groups and the chronic schizophrenic group, are given in Figure 3 below.

Figure 3 - The Distribution of Outcome Scores in Chronic and Acute Schizophrenics and Acute Nonschizophrenic Psychiatric Controls



Although it is clear that a substantial proportion of patients, in all three groups, leaves the hospital within five months of admission, those who remain do so for varying lengths of time; there appear to be gradations of outcome. This finding challenges the notion of an elementary classification into good and poor prognostic groups.

Conclusion - The meaning of prognosis in different groups of patients, and the relationship between outcome and process-reactive designation are complex issues. However, in view of the findings presented, it seems unlikely that the substrate of the process-reactive dimension is to be found in its relationship with prognosis and with other prognostic signs. While the process-reactive dimension correlated with prognosis in some groups of schizophrenics, the significance of this relationship must be examined in the context of the type of schizophrenics involved and the relative importance of other prognostic signs in the prediction of outcome. These issues will be elaborated further in Chapter 7.

6.3 THE PARANOID-NONPARANOID DICHOTOMY

Some authors have speculated that the paranoid-nonparanoid dichotomy might prove to be the most useful of all dimensional approaches to schizophrenia, in that a number of discontinuities between the two subtypes have been noted; for example, in terms of age of onset, level of intact functioning and prognosis. The data obtained in this study for patients designated as paranoid or nonparanoid are given in the following sections.

6.3.1 Differences between Paranoid and Nonparanoid Schizophrenics

The demographic characteristics and hospitalization experiences of paranoid and nonparanoid patients are given in Tables 22 and 23 overleaf.

TABLE 22 - DEMOGRAPHIC CHARACTERISTICS OF PARANOID AND NON-PARANOID SCHIZOPHRENICS

		Chronic Schizophrenics		Acute Schizophrenics		Outpatient Schizophrenics		Combined Schizophrenic Group	
		Paranoid (n = 17)	Non-Paranoid (n = 23)	Paranoid (n = 12)	Non-Paranoid (n = 28)	Paranoid (n = 16)	Non-Paranoid (n = 24)	Paranoid (n = 45)	Non-Paranoid (n = 75)
Age	$\bar{x}$	35,71	27,91	23,83	26,39	29,00	28,42	30,16	27,87
	S.D.	4,88	8,67	3,81	7,28	6,52	6,91	7,08	7,01
	Range	27-44	19-44	18-29	18-42	19-45	21-44	18-44	18-44
Education	$\bar{x}$	11,29	11,00	11,42	10,54	11,38	11,13	11,36	10,87
	S.D.	2,82	1,86	1,78	1,40	2,00	1,36	2,25	1,55
	Range	8-18	9-15	9-15	8-13	8-14	9-14	8-18	8-14
I.Q.	$\bar{x}$	99,59	98,52	101,92	99,43	100,31	98,50	100,46	98,85
	S.D.	14,24	15,24	13,70	10,50	13,18	9,51	13,45	11,73
	Range	80-130	80-138	80-124	80-118	80-120	84-118	80-130	80-138
Married Status	%	73	27	36	67	50	50	38	20
	f	8	3	4	7	5	5	17	15

TABLE 23 - HOSPITALIZATION EXPERIENCES OF PARANOID & NON-PARANOID SCHIZOPHRENICS

		Chronic Schizophrenics		Acute Schizophrenics		Outpatient Schizophrenics		Combined Schizophrenic Group	
		Paranoid	Non-Paranoid	Paranoid	Non-Paranoid	Paranoid	Non-Paranoid	Paranoid	Non-Paranoid
Age at First Hospitalization	$\bar{x}$	26,82	21,35	19,92	23,39	19,56	20,13	22,40	21,72
	S.D.	6,19	3,07	3,06	7,28	6,46	8,78	6,53	6,93
	Range	17-38	16-26	15-24	16-41	16-28	16-38	16-38	16-41
Total No. of Months of Previous Hospitalization	$\bar{x}$	37,35	51,87	8,04	6,12	14,28	12,13	20,98	22,07
	S.D.	30,55	59,52	9,55	10,99	10,66	15,66	23,91	39,72
	Range	5-106	4-223	0-32	0-49	0-34	0-64	0-106	0-223
Total No. of Previous Admissions	$\bar{x}$	3,47	2,96	2,33	2,11	3,50	2,46	3,20	2,48
	S.D.	1,62	1,49	2,06	2,45	2,19	1,47	1,95	1,91
	Range	2-6	1-7	0-6	0-10	0-8	0-7	0-8	0-10
Average Length of Stay per Admission	$\bar{x}$	13,05	23,0	2,12	1,60	3,58	4,62	6,78	18,03
	S.D.	13,89	30,74	1,97	1,75	2,07	6,50	9,87	79,96
	Range	1,25-53	2-111,5	0-5,3	0-5,3	0-7,5	0-32	0-53	0-111,5

Demographic characteristics (see Table 22) - as paranoid patients have been claimed to be better integrated than nonparanoid patients, the differences between the two groups in education, I.Q. and marital status, are of interest. Two-way analyses of variance (unweighted means) were computed for the education and I.Q. data. There were no significant differences between paranoid and nonparanoid patients on I.Q. or education in either of the three groups of schizophrenics (see Appendix A, VIII for summary tables). A Chi-squared test for the difference between married and single individuals in the combined paranoid and nonparanoid groups was significant at the 5%, but not the 1% level ($\chi^2 = 4{,}49$; df = 1).

Hospitalization experience (see Table 23) - two-way analyses of variance were computed for age of onset, length of previous hospitalization and number of previous admissions. There were no significant differences between paranoid and nonparanoid patients on length of previous hospitalization and number of previous admissions (see Appendix A, VIII for summary tables). In age of onset, the interaction between paranoid status and diagnostic group was significant at the 5%, but not the 1% level. Analysis of the simple main effects of the interaction revealed that the chronic paranoid patients had been hospitalized, for the first time, at a significantly older age than the acute and outpatient paranoid patients ($F = 14{,}58$; df = 1,114; $p<0{,}01$).

6.3.2 Paranoid Status and the Process-Reactive Dimension

The number of paranoid and nonparanoid patients among process and reactive patients in the three schizophrenic groups, is given in Table 24 overleaf.

TABLE 24 - THE PROPORTIONS OF PROCESS AND REACTIVE PATIENTS DIAGNOSED AS PARANOID OR NONPARANOID IN ACUTE, CHRONIC AND OUTPATIENT SCHIZOPHRENIC GROUPS

	Paranoid	Nonparanoid	
Process	7	17	CHRONIC
Reactive	10	6	
Process	4	19	ACUTE
Reactive	8	9	
Process	4	13	OUTPATIENT
Reactive	12	11	

A Chi-squared test on the combined sample proved significant (χ^2 = 11,59; df = 1; p 0,01); more paranoid patients are classified as reactive, whereas more nonparanoid schizophrenics are classified as process.

6.3.3 Paranoid Status and Prognosis

The point biserial correlations between paranoid status and length of index hospitalization were not significant in either the acute (r_{pbi} = -0,05) or the chronic schizophrenic group (r_{pbi} = -0,18). The contingency coefficient calculated for the relationship between rated occupational status and paranoid diagnosis in the outpatient group was also not significant (C = 0,20). Therefore the paranoid-nonparanoid dimension was not found to be related to measures of prognosis in either of the three schizophrenic groups.

Conclusion - There were no significant differences between paranoid and nonparanoid schizophrenics on demographic variables or previous hospitalization patterns. Chronic paranoid patients were, however, found to have been hospitalized for the first time at a later age than paranoid patients in the other two groups. More paranoid

patients were classified as reactive, whereas nonparanoid patients were more often classified as process; however, the paranoid-nonparanoid dimension was not found to be related to measures of prognosis. The relationship between the two dimensions does not, therefore, appear to be a simple one. The implications of these findings will be discussed in Chapter 7.

6.4 THE UTILITY OF DIMENSIONAL APPROACHES FOR DIFFERENTIATING THE SCHIZOPHRENIC GROUP

As mentioned earlier, advocacy of the use of dimensional approaches has rested on the assertion that the heterogeneity of the schizophrenic group could thereby be reduced, particularly in terms of performance on experimental tasks, but also on a purely descriptive level; secondly, it has been argued that prognosis may be better predicted by subdividing the schizophrenic group. The extent to which the schizophrenic group is polarized by the process-reactive and paranoid-nonparanoid dimensions can be assessed by examining Table 25a, b and c. In these tables overleaf, descriptive information concerning the schizophrenic groups, and the dimensional breakdown of these data, are given.

TABLE 25 - DIFFERENTIATION OF THE SCHIZOPHRENIC GROUP INTO PROCESS-REACTIVE AND PARANOID-NONPARANOID SUBGROUPS

(a) Age, Education, I.Q. and Marital Status

	Chronic Schizophrenics		Acute Schizophrenics		Outpatient Schizophrenics		Combined Schizophrenic Group	
AGE $\bar{x}$	31,9		25,63		28,65		28,73	
Process-Reactive	31,25	32,88	23,17	28,94	27,06	29,83	27,23	30,43
Nonparanoid-Paranoid	27,91	35,71	26,39	23,83	28,42	29,00	27,87	30,16
EDUCATION $\bar{x}$	11,15		10,08		11,22		11,05	
Process-Reactive	10,63	11,88	10,57	11,12	10,94	11,43	10,69	11,46
Nonparanoid-Paranoid	11,00	11,29	10,54	11,42	11,13	11,38	10,87	11,36
I.Q. $\bar{x}$	98,98		100,18		99,22		99,46	
Process-Reactive	94,70	105,38	99,04	101,71	96,76	101,04	96,67	102,48
Nonparanoid-Paranoid	98,52	99,59	99,43	101,92	98,50	100,31	98,85	100,46
MARRIED STATUS $\bar{x}$	27,50		27,50		25,00		26,50	
Process-Reactive	4,16	62,50	9,52	52,90	5,88	39,13	6,25	50,00
Nonparanoid-Paranoid	13,04	47,06	25,00	33,30	20,80	31,25	20,00	37,78

TABLE 25 (Continued ...) (b) Hospitalization Experience

	Chronic Schizophrenics		Acute Schizophrenics		Outpatient Schizophrenics		Combined Schizophrenics	
AGE AT FIRST HOSPITALIZATION $\bar{x}$	23,68		22,35		21,51		22,56	
Process-Reactive	23,04	24,63	20,61	24,71	20,27	22,36	20,80	23,32
Nonparanoid-Paranoid	21,35	26,82	23,39	19,92	20,15	19,56	21,72	22,40
TOTAL NO. OF MONTHS OF PREVIOUS HOSPITALIZATION $\bar{x}$	45,7		6,69		13,61		21,66	
Process-Reactive	61,67	21,75	6,77	6,59	15,53	12,29	29,20	13,04
Nonparanoid-Paranoid	51,87	37,35	6,12	8,04	12,13	14,28	22,07	20,98
TOTAL NO. OF ADMISSIONS $\bar{x}$	3,2		2,18		3,11		2,74	
Process-Reactive	3,0	3,5	2,04	2,35	2,12	3,43	2,42	3,13
Nonparanoid-Paranoid	2,96	3,47	2,11	2,33	2,46	3,5	2,48	3,2
AVERAGE LENGTH OF STAY PER ADMISSION $\bar{x}$	18,79		2,51		4,55		8,25	
Process-Reactive	26,67	6,98	2,88	1,63	6,46	3,25	12,18	3,76
Nonparanoid-Paranoid	23,0	13,05	1,6	2,21	4,62	3,58	18,03	6,78

TABLE 25 (Continued ...)

(c) Presenting Signs

	Chronic Schizophrenics		Acute Schizophrenics		Outpatient Schizophrenics		Combined Schizophrenic Group	
PRECIPITATING FACTORS %	20,0		27,5		22,5		23,33	
Process-Reactive	13,64	27,7	12,5	37,5	17,65	26,09	12,5	35,71
Nonparanoid-Paranoid	13,04	29,41	10,7	66,67	16,67	31,25	13,33	40,0
FAMILY HISTORY OF PSYCHIATRIC DISORDER %	38,5		17,5		27,5		27,5	
Process-Reactive	45,45	27,7	37,5	4,17	41,18	17,39	35,94	17,86
Nonparanoid-Paranoid	39,13	35,29	17,86	16,67	33,3	18,75	29,33	24,44
CONFUSION ON ADMISSION %	30,0		22,5		25,0		25,83	
Process-Reactive	31,82	27,78	18,75	25,0	17,65	30,43	20,31	32,14
Nonparanoid-Paranoid	30,43	29,41	21,43	25,0	29,17	18,75	24,44	26,67

Many of these results have been presented elsewhere in this chapter, and it should be noted that few of the differences between process-reactive and paranoid-nonparanoid schizophrenics, illustrated in Tables 25a, b and c, were significant. However, in the present format, the consistency of the trend in the results is remarkable. With very few exceptions, reactive and paranoid patients can be seen to possess features which are traditionally considered "benign": loosely speaking, they received more education, scored higher on I.Q. tests, and were more likely to be married; they had been hospitalized for the first time at a later age, had experienced less total time in a mental hospital and tended to stay in hospital for shorter periods; they were more likely to have experienced some stress reasonably related to their hospitalization, less likely to have had a family history of psychiatric disorder, and more likely to have been confused on admission. The reverse of this "benign" portrait characterises the process and nonparanoid patients. However, given the lack of significance of many of the results, these conclusions must remain tentative. While these dimensions are not able to differentiate the schizophrenic group in terms of isolated factors, the composite picture resulting from the application of the process-reactive and paranoid-nonparanoid dimensions would appear to hold considerable promise.

6.5 OUTCOME OF PROCESS AND REACTIVE SCHIZOPHRENICS

Cromwell (1975) speculated that the outcome of reactive schizophrenics was likely to be more variable than that of process schizophrenics. One reason he gave for this possibility was that the reactive group might be able to be further subdivided. The means and standard deviations of the outcome measures used in this study for acute and chronic, process and reactive schizophrenics are given in Table 26 overleaf. (The rating of occupational status, the measure of prognosis for the outpatient group, did not provide suitable data for this analysis).

TABLE 26 - LENGTH OF INDEX HOSPITALIZATION, ON FOLLOW-UP, OF PROCESS AND REACTIVE PATIENTS IN AN ACUTE AND A CHRONIC GROUP OF SCHIZOPHRENICS

	ACUTE		CHRONIC	
	Process (n = 23)	Reactive (n = 17)	Process (n = 24)	Reactive (n = 16)
$\bar{x}$	6,72	2,41	50,46	19,06
S.D.	7,04	4,09	61,05	20,32

As the differences between the means of the process and reactive groups were quite large, a direct test of the difference in standard deviations might have been misleading. For this reason, the difference between the coefficients of relative variation were computed for the process and reactive scores (Peatman, 1947); the acute and chronic patients were dealt with separately as the length of follow-up was different for the two groups. There was no significant difference in the variability of process and reactive scores in the acute (T = 0,81) or the chronic group (T = 0,29).

No support was therefore found for Cromwell's contention that reactive schizophrenics are likely to have more variable outcomes than process schizophrenics. There appeared to be great variability in outcome in both the acute and chronic group; assigning patients to process or reactive categories did not reduce this variability.

The results presented in this chapter will be discussed in greater detail in Chapter 7.

S E C T I O N T W O

CHAPTER 7 - DISCUSSION OF THE PROCESS-REACTIVE STUDY

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SECTION TWO

CHAPTER 7 - DISCUSSION OF THE PROCESS-REACTIVE STUDY

Before discussing the results of the first part of the study, it might be appropriate to re-emphasise the importance of attempts to clarify the nature of dimensional approaches to schizophrenia, in particular, the process-reactive, paranoid-nonparanoid and acute-chronic subgroupings.

- Firstly, it is imperative that means for reducing the heterogeneity of the schizophrenic group be devised. It has been reported that the variance in schizophrenic samples on metabolic measures is one and a half to two times as great as that of normal control groups, and that variability in psychological measures has been found to be four times greater than in normal subject groups (Hoskins, in Houlihan, 1977). There seems little point in investigating any aspect of schizophrenics' behaviour without simultaneously exploring methods for coping with this extreme intra-group variability.

- Secondly, attention has been focused on dimensional subgroupings as one possible solution to the problem of heterogeneity; most studies have, however, sought empirical relationships between these dimensions and schizophrenics' behaviour; few studies have attempted to clarify the meaning of these dimensions or the meaning of their effects when used to subdivide the schizophrenic group. Investigations are required which attempt to clarify the nature of the relationship amongst these dimensions, and between dimensional approaches and schizophrenia. In addition, what are required are assessments of the degree to which these subgroupings represent "actual dimensions of schizophrenia" (Herron, 1977, p.909).

- Thirdly, and most importantly for the present study, Cromwell's

theory of stimulus redundancy is based on the process-reactive dimension; as such, any test of his theory requires an examination of this dimension.

7.1 SUBJECTS

Criticisms have been levelled at methods of sample selection in process-reactive studies; for example, bimodal sampling of patients who score near the extreme points on process-reactive measures (Kokes, Strauss & Klorman, 1977), a practice claimed, by Bromet, Harrow & Kasl (1974), to result in a loss of up to 50% of available subjects. Selection of extreme groups may lead to the inclusion of only a specific subsample of schizophrenics, with consequent limitations on the generality of results. The method of sample selection employed in this study avoided these difficulties by including subjects in the two acute groups and the outpatient group through the process of consecutive admissions and consecutive contacts, respectively. The chronic group consisted of all willing patients in the three hospitals who fulfilled the selection criteria and who had been admitted at least four months previously. In fact, the size of the chronic group dictated the sizes of the other groups. There was, therefore, no exclusion of "unsuitable" patients, nor was there any deliberate attempt to match process and reactive patients on demographic variables. Sappington (1977) has argued that measures of the process-reactive dimension incorporate demographic information and matching designs result in a "reduction in leverage of the independent variable" (p.260).

Despite the specific lack of selection, the five groups of subjects (acute schizophrenics, chronic schizophrenics, outpatient schizophrenics, acute nonschizophrenic psychiatric controls and a normal group) were found to be comparable in terms of age, education and I.Q. The older age of the chronic group was commented on in Chapter 6. On the whole, the three groups of schizophrenics included in the study appeared to be similar, on a number of indices, to the subjects of other investigations. For example, the proportion of first to multiple admission patients was similar to

that reported by Todd (1974), and Keith, Gunderson, Reifman et al (1976), and a similar percentage of single male schizophrenics was recorded by Forrest & Hay (1973).

7.2 THEORIES OF PROCESS-REACTIVE SCHIZOPHRENIA

Each of the four theories which attempt to account for the process-reactive dimension will be examined in the light of the results presented in Chapter 6.

7.2.1 Process and Reactive Schizophrenia as Separate Disorders

No evidence was found in this study to support the view that the process and reactive subgroups represent different disorders.

- No difference was found between process and reactive schizophrenics regarding presenting symptoms (see Table 12). Thus the negative findings of previous studies, reviewed in Chapter 4, were confirmed.

- The distribution of process-reactive scores in the four patient groups were not sufficiently bimodal to suggest the existence of two distinct groups; on the other hand, the distributions were not normal in three of the four groups. Herron (1962) found that individual cases spread out in such a way that the process group shaded into the reactive group, along a continuum. In the present study, in all four groups, the greatest number of patients scored close to the median split on the process-reactive scale (see Figure 2); a finding contrary to the notion of two different groups separated on the basis of process-reactive ratings.

- On a number of indices reactive schizophrenics were not found to be more similar to the psychiatric group than to the process schizophrenic group: these were age at first hospitalization, length of previous hospitalization experience or average length of stay per admission. Neither were reactive schizophrenics more like the psychiatric group in I.Q. and number of years of

education received. Thus, the findings of Tsuang, Dempsey & Rauscher (1976) were confirmed; that is, on a number of measures, the reactive group was inseparable from the process group of schizophrenics.

A number of authors have pointed to the simplistic notions involved in concluding dichotomization of these dimensions. Shakow observed that "when we place patients in such dichotomies, we must keep in mind the truism that a biological process is almost invariably distributed along a continuum. Thus, when we choose to dichotomise, we choose to set up a criterion level along this continuum at which we separate the two classes" (1969, p.637).

As pointed out previously, the view that process and reactive groups might be different disorders is based on the assumption that affective psychoses and schizophrenia constitute separate diseases, and that good prognosis schizophrenia is a sub-class of affective disorder. Bleuler recognized the absence of criteria by which to make this classic distinction (1911, p.208); Kendell (1972) succinctly summarised the present dilemma by saying that: "In spite of the diversity of clinical presentations subsumed under both labels, the many patients with features of both conditions, and the variable prognosis even of those with typical symptoms, schizophrenia and manic-depressive psychosis have remained the twin pillars on which the whole framework of our classification has been based ever since. Although few contemporary psychiatrists are content with this framework, and even fewer would regard manic-depressive illness or schizophrenia as disease entities in the traditional sense, we continue to use this Kraepelinian edifice, if only because it is familiar and we have nothing better to put in its place" (p.383). While a number of authors endorse this view, arguing for a continuum from manic-depressive disorders (good prognosis) to schizophrenia (poor prognosis) (Ollerenshaw, 1973; Procci, 1976; Fowler, 1978), there appears to be strong resistance to the acceptance of such a position, seeing it as a regression to the concept of unitary psychosis proposed by 19th Century German psychiatrists.

However, when examined carefully, the evidence for a separation of affective disorders from schizophrenia, and hence, of reactive schizophrenics from process schizophrenics, can also be interpreted to be consistent with a continuum. For example, both the process-reactive distinction and the differentiation between dementia praecox and depression are based on a differential likelihood of remission (Chapman & Chapman, 1973). Secondly, the family studies referred to in Chapter 4 only support a distinction between process and reactive schizophrenia once a primary distinction between affective psychoses and schizophrenia has been made; they could also be interpreted as offering evidence for the fact that schizophrenics with poor prognoses tend to come from families in which psychiatrically ill members have had poor prognoses, and vice versa. The third basis for the distinction, the absence of affective symptoms in schizophrenics, has been challenged by Shanfield et al (1970), who argued, on the basis of their findings, that affective symptomatology was present, but often obscured in schizophrenics by prominent and bizarre symptoms.

In conclusion, in the face of present findings, it appears unlikely that the process-reactive dimensions could be satisfactorily explained by theories which hold that they represent two separate disorders; the fact that such a dimension has come into existence does question, however, the sharp distinction drawn between the two major functional psychoses, schizophrenia and affective psychoses.

7.2.2 Process-Reactive as a Dimension of Severity

While severity might appear to be a very plausible account of process-reactive findings, it cannot be uncritically evoked as an explanatory construct. The meaning of severity in relation to functional disorders has never been clarified. From the manner in which the term severity is used in psychiatric literature, it can be discerned that three factors are assumed to be associated with greater severity of disorder; these characteristics are not

necessarily, and even not normally, referred to in conjunction with one another. However, the concept of severity has been invoked to explain:

- the poorer performance on research tasks of some patients relative to others,
- the poorer prognosis of some patients relative to others,
- the greater degree of pathology of some patients relative to others.

These criteria were accepted as definitions of severity in the present study.

When applied to the process-reactive dimension, process patients are presumed to be "more ill" or more severely affected than reactive patients. If severity, as defined above, were an adequate explanation of the dimension, one would expect:

- the two groups to show a continuum of performance on experimental tasks corresponding to the increasing impairment of more process patients. Attention will be given to this in the second part of this investigation where the performance of process patients on information processing tasks is compared to that of reactive patients
- process patients to have a poorer prognosis than reactive patients, and
- process patients to be rated as more pathological than reactive patients.

In this study, process patients were not assessed as being more pathological than reactive patients on the basis of symptom presentation. However, with reference to Tables 25a, b and c, reactive patients appeared to be characterized, on the whole, by more "benign" features than process patients. In addition, the significant correlation between process-reactive ratings and length of index hospitalization on follow-up does suggest that reactive schizophrenics tend to have a better prognosis than process patients. In general terms, therefore, severity as a basis for process-reactive differences, received some support in this study.

Nonetheless, the issue is more complex than it at first appears. Three different groups of schizophrenics were specifically selected for this study on the basis of assumed differences in severity; that is, chronic schizophrenics were assumed to be more severely ill than the outpatient (or remitted schizophrenics), and acute patients were assumed to present with varying degrees of severity. These groups did appear to differ in the degree to which they were handicapped by their disorder; for example, the chronic patients had a significantly longer history of previous hospitalization and had been admitted to a hospital significantly more often than the other two groups. The older age of the chronic group may be interpreted as casting doubt on the validity of these findings as indicative of chronicity; however, despite their older age of onset, and although they were admitted to hospitals more frequently than the other two groups, they tended to stay in hospital for a longer period each time they were admitted. Despite this evidence for the greater severity of the chronic group as compared to the outpatient group, chronic patients were not significantly more likely to be rated as process than the other two groups, although such a trend was evident (see Table 14). There is not, therefore, a clear correspondence between severity and the process-reactive dimension.

What is clear from the preceding discussion is that concepts such as severity require clarification before they are offered as explanations for differences between subgroups of schizophrenics.

7.4.3 Process-Reactive Ratings as a Measure of Social Competence

The theory put forward by Zigler et al, referred to earlier, proposes that social competence, as a personal capacity to successfully negotiate social tasks, will determine prognosis in all patients, not only schizophrenics. Further, that process-reactive scales tap this individual capacity or "social maturity".

There has been a call for investigations of the process-reactive dimension in nonschizophrenic patients (Klorman et al, 1977;

Strauss et al, 1977); although Zigler & Phillips (1961) found evidence for the ability of the dimension to predict prognosis in such groups, this finding has not been replicated by independent workers (Bromet, Harrow & associates, 1969, 1971, 1974), nor in the present study. The present findings are particularly pertinent in view of the fact that process-reactive ratings differentiated the nonschizophrenic group on a number of indices; for example, I.Q., age of onset and length of previous hospitalization. If social competence is to be accepted as an underlying attribute of the process-reactive dimension, its importance might have to be restricted to schizophrenia. While such a restriction could be seen to weaken the social competence hypothesis, the particular significance of the dimension for schizophrenia might be an important finding in itself.

In this study, reactive schizophrenics were found to be more socially competent individuals than process schizophrenics, with I.Q., education and marital status as measures of social competence; however, the differences in social competence between process and reactive individuals, on these measures, applied to the nonschizophrenic psychiatric group as well; that is, generally, amongst psychiatric patients, process patients were likely to be less socially competent than reactive patients. However, the relationship between process-reactive ratings (or social competence) and prognosis seemed to be restricted to schizophrenia. The reasons for this are, as yet, unclear.

The presumed prognostic value of social competence has arisen, mainly, from findings of positive correlations between marriage and prognosis, reviewed in Chapter 4. In this study, this relationship was found to be significant only amongst the out-patient schizophrenic group; a finding which might indicate the specificity of certain prognosticators for certain groups of schizophrenics. Such a possiblity will be discussed in more detail later in this chapter. Nonetheless, it is not clear why marriage should have prognostic significance for male schizophrenics and not for female schizophrenics (see Chapter 4),

or for male psychiatric patients generally. Two explanations of these findings have been put forward: married status may be indicative of some more broadly-based competence which has particular significance for the prognosis of male schizophrenics, or it may reflect a source of emotional support in the environment, which is of particular importance to the recovery of male schizophrenics. For example, Held & Cromwell (1968) have speculated that the likelihood of discharge from a hospital might be greater for a man who has a wife and children at home. However, Walker & Kelley (1960) proposed an alternative view of the notion of social support; on the basis of their study of 1 800 patients, they concluded that the 'married-never married' dichotomy could be rephrased to reflect the existence of a greater-smaller number of close relatives (p.499). They thus implied that marriage indicated the extent of the social network of support available to the schizophrenic; a matter they saw as important to recovery. This hints at a broader view of the social competence hypothesis: one that Zigler, Levine & Zigler (1976) themselves broached when they stated that process-reactive measures reflected, not so much the psychological make-up of the individual as the social-cultural nexus which the individual experienced. The idea of a broader, more socially-based view of competence and prognosis will be offered in greater detail at the end of this chapter.

7.2.4 Process-Reactive Differences as an Epiphenomenon of Traditional Prognostic Signs

The argument for this position is best put by Gittelman-Klein & Klein (1969): "Process-reactive scales not only fail to define a single dimension, but also fail to identify homogeneous patient groups. The scales were empirically devised by selecting many items of prognostic value from the literature. As a result, they are a mixture of items hopefully related to prognosis but not necessarily to each other. Since a patient's score on these scales is the arithmetic mean of all the items, patients with identical scores may have markedly differing scale profiles.

Therefore, the scales do not isolate clinically homogeneous patient subgroups, although they may be homogeneous with respect to outcome. It is therefore erroneous to equate, as is done, these scale scores with a patient-descriptive label, such as process or reactive schizophrenia ..... To sum up, these scales are best considered simply empirically compound prognostic measures that identify neither a dimension nor patient types" (p.47). This view has been echoed by others, perhaps not as explicitly (Chapman, Day & Burstein, 1961; Kokes et al, 1977; Strauss et al, 1977). The traditional prognostic signs are age at onset, rapid versus gradual onset, precipitating factors, confusion, family history of psychiatric disorder and total length of previous hospitalization (see Chapter 4).

All these signs were assessed in the present study except speed of onset, which, it was argued in Chapter 5, presented insurmountable problems for assessment. Neither precipitating factors, family history or confusion were significantly related to outcome measures in either of the three schizophrenic groups (see Table 20). Results on the prognostic significance of these signs have been contradictory. For example, Wallis (1972) and Sartorius et al (1978) have affirmed their value, especially of acute onset and precipitating stress. However, consistent with the present study, one of the most recent investigations of prognosis in schizophrenia failed to find any relationship between these signs and outcome (Bland & Parker, 1978). Additional evidence against the prognostic significance of these signs can be inferred from the fact that, in the present study, chronic, acute and outpatient schizophrenics did not differ in the proportion of individuals in each group who presented with such signs. As the chronic group consisted of patients who could be regarded as demonstrating poor prognosis, one would have expected this group to show fewer such signs than the remitted schizophrenic group.

Problems of assessment are a likely reason for the lack of consistent findings in reported studies. In Chapter 5 it was

pointed out that acute versus gradual onset had not been operationalized in a single study which had reported it's significance. As Herron (1962) concluded from his review, the period prior to hospitalization is often characterized by many adjustments on the part of others to bizarre behaviour; and judgements as to acute or gradual onset are likely to be reconstructions of past events. This point is further emphasized by Astrup, Noreik & Elkes (1966) in their comment about establishing age of onset: "There would be considerably more uncertainty if age of onset were defined as the time when the first minor mental symptoms appeared" (p.29); the authors thus implicitly acknowledge the difficulties of judging speed of onset. The presence or absence of precipitating events presents similar problems. The author found that most patients attributed their hospitalization to some stressful exogenous factor, a matter not easily resolved by attempts to define "justifiable" and "acceptable" stresses; for example, as in the schemes advocated by Tsuang, Dempsey & Rauscher (1976) and Beck (1978).

Nonetheless, it is clear that a considerable degree of uncertainty exists regarding the importance of such signs in the assessment of prognosis. However, the argument put forward by Gittelman-Klein & Klein (1969), at the beginning of this section, might rest on the relationship between process-reactive measures and length of previous hospitalization. Length of previous hospitalization was significantly related to outcome in all patient groups in this study, except the outpatient schizophrenic group. Therefore the possibility remained that the prognostic significance of the process-reactive rating may have been derived from its relationship to length of prior hospitalization. This, however, was not found to be the case; there were no significant differences in length of previous hospitalization between process and reactive schizophrenics, except in the chronic group (see Table 13); process-reactive ratings were not significantly related to the measure of prognosis in this group (see Table 19), thus making it unlikely that the process-reactive dimension derived its relationship with prognosis from its association with prior

hospitalization.

It would thus appear to be mistaken to see the process-reactive dimension as nothing but an "empirically compound prognostic measure", as do Gittelman-Klein & Klein (1969). Except for length of previous hospitalization, no evidence was found to support the assumed prognostic significance of traditional signs; and, length of previous hospitalization was not found to be able to account for the prognostic singificance of the process-reactive measure. Nonetheless, these results do not refute Gittelman-Klein & Klein's first assertion: "process-reactive scales not only fail to define a single dimension, but also fail to identify homogeneous patient groups". In fact, this would seem to be the fundamental issue to be addressed in process-reactive studies.

In the present study, no evidence was found for the notion that process and reactive schizophrenia are two separate disorders, nor for the view that process-reactive ratings are compound prognostic assessments. Severity of illness and/or social competence received some support as possible underlying components of process-reactive measures. However, neither hypothesis can be endorsed without question; both the specificity of social competence to schizophrenia, and the substance of the concept of severity when applied to functional disorders require explication. Some speculations in this regard will be offered at the end of this chapter. For the moment, however, Cromwell's hypothesis concerning the substrate of the process-reactive dimension being separate disorders, received no support in this study. His alternative view of the dimension reflecting the severity of the disorder, could not be discounted.

7.3 THE PARANOID-NONPARANOID DICHOTOMY

Although Cromwell (1968) initially ascribed significance to both the paranoid-nonparanoid and the process-reactive dichotomies, he later speculated that diagnoses of paranoia might reflect very little about the basic nature of schizophrenia. Instead, he argued, such

diagnoses were more likely to be given to intelligent individuals, and in settings with favourable staff-patient ratios such as veteran's administration hospitals in the United States, where intensive contact with patients was possible, thus increasing the likelihood that delusions would be recognised.

In the present study patients were drawn from three state hospitals. The shortage of highly skilled personnel in these hospitals made it a very remote possibility that paranoid diagnoses were related to privileged treatment facilities. In addition, no differences in I.Q. or education were found between paranoid and nonparanoid patients in either of the three schizophrenic groups studied (see Table 22). It would therefore be difficult to dismiss the paranoid diagnoses of the patients in this study as artefacts of the treatment facilities and/or the greater intelligence of individuals so diagnosed.

However, given the possible importance of paranoid-nonparanoid status, how is it to be related to the process-reactive dimension? According to the review presented in Chapter 4, the findings have been contradictory: Zigler & Phillips (1960), Johannsen (1963), Eisenthal, Harford & Solomon (1972) and Mc Creary (1974), have all reported findings which indicate independence of the two dimensions; on the other hand, some studies have reported a preponderance of paranoid patients among reactive groups and a tendency for process patients to be diagnosed as nonparanoid (Held & Cromwell, 1968; Zigler & Levine, 1974). In the present study, the latter trend was supported; that is, a greater proportion of paranoid patients was found in the reactive category, whereas the reverse was true of nonparanoid patients. This pattern was found to hold among all three groups of schizophrenics. It is important to note that paranoid patients, like reactives, were more likely to be married than nonparanoid patients and that a more "benign" description applied to paranoid as opposed to nonparanoid patients (see Table 25 a, b and c). From these points of view, the paranoid dimension appeared to have a considerable degree of overlap with the process-reactive categories. However, despite this degree of concomitance

between the two dimensions, paranoid status was not found to be significantly related to prognosis in either of the three schizophrenic groups. A similar result was reported by Evans, Goldstein & Rodnick (1973). The relationship between the process-reactive and paranoid-nonparanoid dimension would appear, therefore, to be more complex than originally envisaged. For the purpose of differentiating schizophrenic groups on a descriptive level, however, the paranoid-nonparanoid dimension would seem to offer little advantage over the process-reactive subdivision (see Table 25a, b and c). In addition to which it was found to lack a significant relationship to prognosis. Klein & Davis (1969) have asserted that "a classificatory system is valid insofar as it allows correct statements that extend beyond the defining characteristics of the class about members of the class" (p.7). In this sense, the process-reactive dimension, with its relatively greater potential for prognostic prediction, would appear to hold more promise as a classificatory system than the paranoid-nonparanoid dichotomy.

In this study an equal number of patients in the three schizophrenic groups was diagnosed as either paranoid or nonparanoid. There was therefore no trend for the number of paranoid patients to diminish in the more chronic groups. Previous findings of such a trend have been shown to be due, not to paranoid patients' invulnerability to chronicity, but to changes in diagnosis from paranoid to other subtypes on readmission (Depue & Woodburn, 1975). In this study, patients in the chronic and remitted groups, were assigned to a paranoid subgroup if, at any time, they had received a diagnosis of paranoia. Prior studies have included patients in the paranoid subgroup if the initial and/or the final diagnosis was one of paranoia. The author would argue that, if the dimension is to be useful, the diagnosis of paranoia at any time in a patient's career should be significant. If not, paranoia should properly be regarded as a state or phase of the disorder, much like acute, chronic or remitted states; in which case, the dichotomy between paranoid and nonparanoid patients should be investigated, not as a potential principle for subgrouping, but as an aspect of the course of the disorder.

In conclusion, Cromwell's (1975) views on the expendability of the paranoid dimension for differentiating schizophrenic samples might have some merit. Not, however, for the reasons he proposed. Process-reactive measures would appear to incorporate the majority of features differentiated by the paranoid-nonparanoid subdivision, thus making it seem unnecessary to employ both dimensions for the purpose of stratifying schizophrenic groups. The process-reactive dimension has the advantage of being related to prognosis; the importance of the process-reactive dimension to prognostic assessment requires careful consideration, however. Cromwell (1968) speculated that reactive-paranoid and process-nonparanoid patients might lie at two extremes in terms of cognitive functioning; the utility of such a two-dimensional distinction for isolating groups of patients who differ on information processing tasks will be examined in the second part of this study.

7.4 OUTCOME IN PROCESS AND REACTIVE SCHIZOPHRENICS

In Chapter 5, Cromwell's views on the course and outcome of high and low redundancy schizophrenics were outlined. In his opinion, high redundancy (or process) schizophrenics would be likely to show uniformly poor prognosis, whereas low redundancy (or reactive) schizophrenics would tend to be more variable in outcome (depicted in Figure 1). Houlihan's (1977) review did not support Cromwell's views: schizophrenics with extremely good post-hospital adjustment were found to be equally divided between those with good and those with poor premorbid histories, while those with poor post-hospital adjustment almost all had poor-premorbid histories. In this study no support was found for Cromwell's contention that the outcome of reactive schizophrenics was likely to be more variable than that of process schizophrenics. In this study the measure used to assess outcome in the outpatient schizophrenic group was not suitable for making estimates of internal variability. In the chronic and the acute schizophrenic groups, however, no differences were found in the variability of outcome scores of process and reactive patients. In Chapter 6 it was observed that variability in outcome appeared to be characteristic of all the schizophrenic

groups studied; making a distinction between process and reactive patients did not reduce this variability.

Vaillant (1978) asserted that there was, generally, no clear relationship between process-reactive status and outcome. The present study supported the variable relationship between process-reactive ratings and a measure of prognosis on follow-up. Firstly, the relationship did not reach significance for the chronic group. Secondly, the distribution of prognostic scores, expressed as the length of index hospitalization on follow-up, gave no indication of two distinct groups, a good- and a poor-prognosis group (see Figure 3). Thirdly, process-reactive scores accounted for only 24%, 17% and 6% of the variance in outcome in an outpatient, acute and chronic group, respectively. Two conclusions could be drawn from these findings: Firstly, process-reactive ratings were not pertinent to prognostic assessment for all groups of patients. It would appear to have its greatest utility for acute and outpatient schizophrenics; however, the simpler index, length of previous hospitalization, could supplant process-reactive ratings for prognostic assessment in all inpatient groups studied. Secondly, while process-reactive ratings may be tapping some dimensions important to the outcome of schizophrenics, the contribution of the process-reactive categorization to knowledge of outcome was found to be relatively small. Both these conclusions require more detailed attention, and will be dealt with below.

7.4.1 The Relative Contribution of Process-Reactive Ratings to Assessments of Outcome

Positive correlations between process-reactive ratings and measures of outcome are frequently reported in the literature (see Chapter 4); significant findings were also reported in this study with regard to the data obtained from the outpatient and acute schizophrenic groups. Few investigators, however, in making claims for the efficacy of process-reactive scales in the prediction of prognosis, make explicit the contribution of the scales as compared to the contribution of other variables to the

knowledge of outcome. For example, Wittman (1941) claimed a good relationship between the Elgin Scale and outcome; in a replication study, however, Chapman, Day & Burstein (1961) found that the Elgin Scale accounted for only one eighth of the variance in outcome. On the Phillips Scale, correlations with outcome have been found to be of the order 0,38 to 0,45 over three year follow-up periods (de Wolfe, 1968; Cancro & Sugerman, 1968). Meichenbaum (1966) obtained a correlation with outcome of 0,39, using the Ullmann-Giovannoni Scale. In none of these studies were data presented to indicate the extent of the contribution of other variables to the knowledge of outcome.

In this study, significant correlations with outcome were expressed as percentages of the variance (see Table 21) in order to illustrate the relative contribution of process-reactive ratings and length of previous hospitalization to assessments of outcome in the three inpatient groups studied. In the acute and chronic schizophrenic groups and the nonschizophrenic psychiatric control group, length of previous hospitalization accounted for a greater percentage of the variance in outcome measures than process-reactive ratings. Only in the outpatient schizophrenic group was length of previous hospitalization found to be unrelated to the measure of prognosis used.

7.4.2 The Importance of Previous Hospitalization as a Measure of Outcome

The findings of the present study confirm the results of the WHO IPSS in which it was found that 64% of the variance in outcome was accounted for by chronicity involving previous hospitalization and long duration of illness using multiple outcome criteria, "duration of previous hospitalization (prior to initial evaluation) was the most powerful predictor of each of the 2-year follow-up criteria" (Kokes et al, 1977, p.198). These findings were confirmed on 5-year follow-up. However, there has been considerable resistance to the notion that "it is obvious that an individual who has been hospitalized for several years is less likely to make a satisfactory recovery than one who has just

entered hospital for the first time" (Johannsen, 1963, p.380). Critics have argued that these findings have resulted from the use of simplistic measures of prognosis, such as discharge from hospital (for example, Strauss et al, 1977). While this criticism could not be levelled against the International Pilot Study of Schizophrenia, the logic of the criticism itself requires careful consideration.

The arguments against using length of index hospitalization as a measure of prognosis, as is the practice in most studies (Beck, 1978), centres around the assertion that length of hospitalization is confounded by the needs of the hospital, the psychiatrist and the family (Bromet, Harrow & Tucker, 1971). Further, it is argued, prognosis is not a unitary phenomenon, and may involve several semi-independent areas of functioning. To cope with this, Strauss & Carpenter (1972) have devised a simple 4-item scale to assess frequency of social contacts, percentage of time employed, severity of symptomatology, and amount of time spent out of hospital on follow-up. While this attempt at a more comprehensive evaluation is laudable, it should not mask the fact that these outcome criteria are also confounded with factors other than the "disease" within the patient. The author would argue that prognosis cannot be regarded as some property of schizophrenia alone; it is perhaps most usefully employed as a construct to describe the complex interplay between individually-based factors and the social nexus in which a patient finds himself. Discharge from a psychiatric hospital may well be the manifestation or result of a complex set of judgements of precisely those factors assessed by the Strauss & Carpenter (1972) scale, referred to above. Investigations of the nature and determinants of discharge decisions are sorely needed to illuminate the concept of prognosis as applied to schizophrenia.

There is clearly a growing recognition of the limitations of individually-based prognostic prediction and an awareness of the interaction between disease-factors and the social systems in which disorders are identified and treated. For example, Murphy

(1978) argued that length of stay in hospital was primarily determined by the efficiency of treatment and the view of mental illness adopted by the treatment staff whom, he believed, reflected the societal conceptions of mental illness. This argument is congruent with that previously elaborated: discharge from hospital may constitute a complex judgement of a patient's potential to return satisfactorily to the community.

7.5 AN ALTERNATIVE INTERPRETATION OF THE PROCESS-REACTIVE DIMENSION

A number of questions have been raised in the course of this chapter. Severity and social competence as explanations of process-reactive findings both received some support in this study. However, their precise meaning and the consequences for our understanding of schizophrenia remained unclear. Secondly, although the process-reactive dimension was seen to have some relationship to prognosis, it was illustrated that process-reactive ratings contributed only partially to knowledge of outcome. Thirdly, the issue raised by Gittelman-Klein & Klein (1969) concerning whether process-reactive ratings defined a single dimension, or identified homogeneous patient groups, remained unresolved. The author would offer the following interpretation of the process-reactive dimension in an attempt to clarify some of these questions:

Wing (1978) argued that at least four factors contributed to outcome: the clinical condition itself; severity; secondary handicaps such as altered self-attitudes and negative attitudes on behalf of potential social support systems; and extrinsic disadvantages of various kinds, for example, poor education, a lack of vocational skills, and an absence of social supports. Wing saw these extrinsic factors as independent of schizophrenia and disadvantages in themselves. On the basis of the positive correlation between prognosis and process-reactive ratings found in this study, it was concluded that, on the whole, reactive patients had better prognoses than process patients. To the extent that process patients can be seen to be more severely ill than reactives, the idea of severity as an explanation of the process-reactive dimension was supported. However, in terms of Wing's analysis, if severity

were to be regarded in this light, it would appear to be a rather gross construct, synonymous with relatively better versus relatively worse outcome. Wing's argument makes it clear that the concept of severity needs to be more carefully delineated before it can be accepted as providing a basis for the process-reactive distinction. On the other hand, the scheme offered by Wing, provides a framework for an alternative interpretation of the process-reactive dimension.

Earlier it was noted that comparisons of process and reactive patients on individual indices were often not significant. However, when placed in a more composite picture (as in Table 25a, b and c), division of patients into process and reactive categories gave rise to an overall impression of a more "benign" portrait of reactive patients as compared to those designated as process. It would seem that the process-reactive dimension might be assessing primarily what Wing referred to as "extrinsic disadvantages", and in this way has implications for outcome. Such a view would be compatible with the contention that the process-reactive dimension did not identify homogeneous patient groups (Gittelman-Klein & Klein, 1969). These speculations merit careful investigation as a further step towards clarifying the heterogeneity evident in schizophrenic samples.

In conclusion, the process-reactive dimension does not appear to describe subgroups of patients in terms of prognosis, but instead delineates some aspects of the intricate interplay of factors involved in determining prognosis. Investigations of the dimension would appear to have been part of a preliminary step in the direction of a more complex understanding of the course and outcome of the schizophrenias. Thus, Cromwell's views on the possibility of a clear separation of these two groups, explicable in terms of severity or different disorders, does not appear to be tenable. The subsidiary hypothesis of greater variability in outcome amongst reactive patients did not receive support in this study, and the nature of the paranoid-nonparanoid distinction and its relationship to the process-reactive dimension requires further investigation. Some attempt will be made in the second part of

this study to investigate the effects of combining these two dimensions in order to isolate groups of patients who are homogeneous with regard to cognitive functioning.

The fact that the process-reactive dimension was interpreted as having failed to form a sufficient basis for classification with regard to outcome in schizophrenia does not necessarily diminish its potential for allowing a more adequate analysis of the performance of schizophrenics on experimental tasks. An examination of this comprises the subject matter of the second part of this investigation. Furthermore, the findings and conclusions up this stage, provide no assault on one aspect of Cromwell's stimulus redundancy theory; that is, his contention that subgroups of schizophrenics can be distinguished on the basis of their information processing characteristics. However, the results presented and the arguments offered do make it appear less likely that the process-reactive distinction will constitute a sufficient basis for identifying and classifying styles of information processing amongst schizophrenics.

S E C T I O N T H R E E

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SECTION THREE

CHAPTER 8 - SCHIZOPHRENIA AND THE EMPHASIS ON COGNITION, PERCEPTION AND ATTENTION

Earlier in this thesis it was pointed out that many early investigators, such as Kraepelin, Bleuler and Freud, recognised the importance of disturbances in perception and cognition in patients suffering from schizophrenia. The many biographical accounts of psychotic states similarly emphasised the "unreality" which accompanied abnormal perceptual and attentional experiences. These observations remained largely unexplored until Shakow began his systematic studies on reaction time. From the 1950's to the 1970's, a small group of people continued in their efforts to delineate the psychological deficit of schizophrenics, but the major research effort went into psychodynamics, family studies, genetic and biochemical investigations. It was not until the 1960's that cognitive and descriptive studies of schizophrenia became popular. Many workers began to realise that reliable methods of delimiting and classifying the schizophrenias were necessary precursors to aetiological studies (Broen, 1968; Mc Ghie, 1970). Ample evidence of differences between schizophrenics and normals on cognitive and perceptual tasks was produced, but the effort was largely hampered by the lack of appropriate theories to guide research and by which to interpret results (Kilburg & Siegel, 1973). Most current work in this area can be broadly seen to be based on one of three theories: response interference theory, interference theory, and processing capacity theory. As will be illustrated, Cromwell's theory is congruent with processing capacity theory and therefore greater attention will be paid to this approach than to the others.

8.1 THE FOCUS ON ATTENTION AND PERCEPTION

Comments on early developments leading to an emphasis on attention and perception must, of necessity, be brief and selective. A number of comprehensive reviews of this work have, however, appeared

in the literature (amongst others, Venables, 1964; Lang & Buss, 1965; Yates, 1966a; Mc Ghie, 1969; Ornitz, 1969; Holzman, 1969, 1970; Zimet & Fishman, 1970; Zubin, 1975; Hamilton, 1976; Garmezy, 1977; Neuchterlein, 1977a & b).

Although Bleuler attributed primacy to an associational disturbance, many writers acknowledge his early observations regarding deviant attentional patterns among schizophrenics (Neale & Cromwell, 1972; Mc Guire, 1975; Zubin, 1975; Chapter 2 of this thesis). The emphasis on associative processes and their impairments, inherited from Bleuler, declined gradually and seemed to have been finally put to rest by the work of Moon (1968) and Mefferd (1969). These studies demonstrated that although schizophrenics did evidence more 'distant' associations than nonschizophrenics, they were also more likely to mishear words; a phenomenon not attributable to lapses in attention, but rather to failures to perceive stimulus words correctly. Their 'distant' associations were appropriate responses to phonetically similar stimulus words.

Following the vogue for association studies, there was a series of investigations into conceptual functioning and a rather vaguely defined 'thought disorder'. Despite Cameron's early pessimistic remarks regarding the usefulness of such approaches, a large number of studies were conducted using as their measures proverbs, metaphors, similarities, sorting tasks, word identity tasks and projective tests (Cameron, 1939 in Higgins, 1969). In addition to the rather simplistic normal-schizophrenic comparison designs involved in these studies, many writers pointed to the flaws of these measures; particularly with the realization that many factors contribute to performance on such conceptual tasks, thus making them very difficult to interpret (Lovinger, 1956; Lothrop, 1961; Kopfstein & Neale, 1972). Besides the work done on association and conceptual functioning, there was a long tradition of studies investigating the sensory capacities of schizophrenics, despite which "it remains unresolved whether patients in fact differ from normals in their sensory functioning" (Kietzman & Sutton, 1977, p.435).

However, much of this early work was largely empirical and lacking in theoretical direction (Holzman, 1969). As Otteson and Holzman (1976) commented: "It is true that investigators have shown a preference for standard procedures that are recommended by their convenience ... rather than by reasonable expectations that these techniques can illuminate the nature of cognitive and perceptual disorganizations" (p.125). For a number of reasons, these largely undirected investigations became increasingly focused on more specific aspects of perceptual functioning, particularly attention (Harrow, Tucker & Shield, 1972; Keith et al, 1976; Lerner et al, 1977). Again it should be emphasized that this focus was not new; Freud had hinted at it and the early psychoanalysts had consistently described psychosis as a basic failure in ego functions (Grumet, 1969).

Some of the reasons for this renewed interest included the following evidence and associated lines of argument:

- The mass of biographical, autobiographical and clinical data which indicated that disturbances in attention and basic perceptual processes might precede the more obvious clinical presentation of schizophrenia (Davie & Freeman, 1961; Chapman & Mc Ghie, 1962; Chapman, 1966; Ornitz, 1969; Freedman, 1974). While lengthy descriptions of these disturbances have been produced, many of them can be subsumed under a view of the schizophrenic as an individual who has difficulty in organizing and regulating sensory intake. Kirk (1973) has explicated a theory relating disturbances in these basic processes to interpersonal experiences and schizophrenic symptomatology. In addition, a number of authors have speculated about the plausibility of delusions being developed on the basis of such disturbances (Sarvis, 1962; Chapman, 1966). However, some doubts exist as to whether these dysfunctions are exclusive to schizophrenia. Tucker, Harrow, Detre & Hoffman (1969) compiled a 24-item Perceptual Experience Inventory on the basis of Chapman's descriptive work and tested 73 consecutive admission patients shortly after admission. They could find no evidence to suggest

that schizophrenics experienced anomalies of perception and attention to a greater extent than other recently admitted psychiatric patients. Instead, these authors concluded that such experiences were related to high levels of chronic anxiety rather than to schizophrenic diagnosis.

- The comprehensive reviews of Buss & Lang (1965) had indicated that interference theory could account for more of the findings to that date than any other competing explanation. In broad terms, interference theory described a number of dysfunctions including the inability to maintain attention, to purposefully switch attention and to resist distraction. As such observations gained momentum, more of the findings in other areas began to be interpreted along the lines of an attentional dysfunction. For example, Pavy (1968), Maher (1972) and Bull & Venables (1974) all offered explanations of schizophrenics' deviant verbal behaviour in terms of a basic inability to maintain an attentional focus. Similarly, deviant perception (Silverman, 1964; Venables, 1964), idiosyncratic verbal associations (Cromwell & Dolecki, 1968), broadened conceptual performance (Payne, 1966) and slow reaction time (Shakow, 1962) have all been viewed as manifestations of attentional deficit (Neale & Cromwell, 1972).

- In addition to the above, there was a gradual accumulation of data, from often unrelated areas of research, attesting to the significance of disturbances in perception and attention for manifest schizophrenic pathology. For example, Rorschach studies (Cohen, Senf & Huston, 1956; Belmont et al, 1964); the work on size constancy (Lovinger, 1956; Weckowicz, 1958; Weckowicz & Blewett, 1959); sensory deprivation investigations which demonstrated that some schizophrenics could tolerate such conditions better than normals (Harris, 1959; Mehl & Cromwell, 1969); discrimination learning tasks (Nolan & Anderson, 1973); and experiments showing the difficulties schizophrenics experienced with the cross-modal transfer of information (Chapman & Mc Ghie, 1962). There were also the reviews of

independent work, such as Polyakov's (1969) review of Russian experiments, from which he concluded: "the overinclusive utilization of stimuli and attributes, the ease of distraction by irrelevant stimuli and the use of superfluous, irrelevant information in the thinking and the perception of the schizophrenic - we believe it is disturbances of these processes which underlies the schizophrenic disorder" (p.372). Lastly, there were the later reviews of Yates (1966a), Zimet & Fishman (1970) and Nuechterlein (1977a & b), all of which gave prominence to the view that some form of perceptual deficit was basic to the schizophrenic condition.

- Lastly, there was the search for psychological dimensions that were easier to relate to psychophysiological findings in the field of schizophrenia than the more complex processes of language and thinking. It was Claridge's opinion that the cognitive and selective attentional aspects of behaviour fulfilled this need because they could be related to the state of arousal of the subject and to a number of personality dimensions (1972). In his review, Zubin (1975) pointed out that much of the work on attention in schizophrenia was based on an assumption that attention varied with the state of arousal. This conclusion was corroborated by a number of writers (for example, Barucha-Reid, 1962; Agnew & Agnew, 1963; Venables, 1964; Spohn, Thetford & Cancro, 1970; Lapidus & Schmolling, 1975).

By arousal is meant an internal state varying from sleep to alertness which can be measured by indirect and peripheral responses. It is reasoned that attentional processes - in the sense that they exert control over the amount and kind of sensory data which enter the perceptual system - could be functionally related to the level of arousal. Earlier views of schizophrenics being either hyper- or hypoaroused are no longer regarded as tenable and one review concluded that schizophrenics may be found at both extremes of somatic arousal; further, that any one schizophrenic may vary between states of over- and under-arousal at different times (Gruzelier & Venables, 1975). Taking

cognizance of the complexity of the relationship between arousal and attention, Claridge has argued that it is the manner in which the two covary which is of importance (1972). The relationship between the two has been represented by an inverted U-shaped curve, with impaired performance at high and low levels of arousal. Further evidence for the fundamental importance of arousal processes in schizophrenic pathology has been inferred from Mednick's study of high-risk children, in which he found lability of responsivity among vulnerable children.

However, these views have not been without criticism (for example, Berlyne, 1970). Stern & Plapp (1969), drawing on Lacey's work, emphasized the tenuous nature of any unified view of arousal, particularly in view of the low correlations obtained between central and peripheral indices of arousal. Hamilton (1976), drawing on the work of Bacon, emphasized that arousal-related attention decrements only seemed to occur towards stimuli that initially attracted less attention in any event. This, he believed, illustrated the important role of subjective decisions of task importance and attention deployment in the arousal-attention relationship. In a well-controlled study, Spohn, Thetford & Woodham (1970) failed to support the hypothesis that differences in level of arousal in schizophrenia were systematically related to attentional dysfunction.

8.2 DIMENSIONAL APPROACHES TO COGNITIVE RESEARCH

In the last section some of the developments leading to an increased focus on cognition in schizophrenia were described. Following the Harris (1957) and Silverman (1964) studies, reviewed earlier in this thesis, in which the process-reactive and paranoid-nonparanoid subgroupings gave rise to greater homogeneity in the analysis, there emerged a trend towards cognitively-oriented research employing subgroup classifications. Much of this research appeared to be relatively directionless, as if workers were searching for any dependent variables on which subgroups could be shown to differ. There seemed little rationale in the attempts to find differences

between subgroups, but an enormous body of literature was accumulated attesting to the existence of differences between various subgroups on a variety of tasks related to attention. Many excellent reviews dealing with this work have appeared (for example, Higgins, 1964, 1969; Yates, 1966a) and therefore the following discussion will be highly selective and serve merely to illustrate some of the trends that have emerged from work employing subgroup classifications.

8.2.1 Acute-Chronic Differences

Although Shakow and his colleagues, in their long series of studies, found few attentional differences between acute and chronic patients, even very early work began to indicate that such differences might exist. For example, Lovinger (1956) found that chronic patients showed greater reduced size and distance constancy than acute schizophrenics. It had also been reported that while chronics appeared to have narrowed attention, acute patients seemed to suffer from an inability to restrict their range of attention (Venables, 1964; Ornitz, 1969). However, such findings cannot be accepted at face value: the acute-chronic differences have been found to be exacerbated on tasks requiring sustained attention, but not very evident when performance requires short bursts of attention (Orzack & Kornetsky, 1966). Secondly, distraction has been found to affect the performance of these two groups differently. For example, distraction has been reported to disrupt the performance of chronic patients to a greater extent on high-level, in contrast to low-level, performance tasks (Oltmanns & Neale, 1975).

The importance which should be accorded to findings of acute-chronic differences remains equivocal, however. Two criticisms have been used to question the usefulness of making acute-chronic comparisons: firstly, the wide variations in criteria used to construct such subgroups, and secondly, findings which indicate that other long-term institutionalized persons, for example, prison inmates, show deviant attentional behaviour (Silverman, Berg & Kantor, 1965). Acute-chronic comparisons may thus throw light on

the effects of institutionalization, but reveal little about differences among schizophrenics in particular.

8.2.2 Paranoid-Nonparanoid Differences

There exists a large corpus of work attesting to differences between these two groups of patients. In the Shakow studies they found paranoid patients, in contrast to hebephrenics, to be more like their normal controls on the vast majority of their measures. In Silverman's (1964,a & b) work on the perceptual modulation of sensory input, he found that paranoids could be classified as "augmenters" and nonparanoids as "reducers" of sensory information. That is, paranoids were characterized by extensive scanning and highly differentiated and organized field articulation, whereas nonparanoid patients were restricted scanners with diffuse field articulations. In addition paranoid patients, as compared to nonparanoids, have been found to underestimate size (Davis, Cromwell & Held, 1967), to be overinclusive (Payne & Caird, 1967) and to be less distractable (Mc Ghie, 1969). All of the former led Mc Ghie to conclude that there was clear experimental support for paranoid-nonparanoid differences, and further, that paranoids have a highly selective type of attention which enables them to screen out extraneous stimulation to a greater extent than non-paranoids and normals. Silverman (1964a & b) speculated that this restriction of attention operated in order to allow only delusionally-relevant input into the system.

8.2.3 Process-Reactive Differences

In Harris' (1957) experiment he found that while reactives under-estimated size, process patients tended to overestimate. Silverman found reactives to be very similar to paranoids, that is, they were augmenters, and process patients to be reducers, like nonparanoids. De Wolfe (1974) summarised the evidence on the existence of two types of thinking in process and reactive patients and concluded that process patients are both less responsive to external stimuli and show a less well developed cognitive structure, despite the fact that they scored higher on

an I.Q. test than the reactives. He attributed the poorer level of reactive patients, in the latter instance, to the disruptive effect of acute disturbance. Venables (1964) found process patients, in contrast to reactives, to show patterns of narrowed attention. In attempts to link the process-reactive dimension to physiological functioning and drug effects, Evans et al (1972) found process patients to respond better to phenothiazines and reactives to placebos. In their recent review, however, Klorman, Strauss & Kokes (1977) concluded that there was, as yet, no evidence for arousal differences between process and reactive patients.

8.2.4 Interactions Between the Subgroups

The question of interaction between these dimensions arises particularly when one examines the similarities between Venables' (1964) and Silverman's (1964a & b) findings; that is, narrowed attention has been associated with process, chronic and non-paranoid patients, whereas the concept of widened attention has been used to describe the performance of reactive, acute and paranoid patients.

It appears that, as patients progress from the acute to the chronic stage, a number of changes in the other dimensions occur. For example, amongst chronics, process patients appear to be more aroused than reactives, a finding that has not been corroborated in acute patients (Klorman, Strauss & Kokes, 1977). On the other hand, with increasing chronicity, many of the attentional differences between process-reactive and paranoid-nonparanoid patients have been found to diminish (Silverman, 1964a & b; Furth & Youniss, 1968; Orzack & Kornetsky, 1971). Venables (1964) hypothesized that the hyperarousal thought to be typical of chronic schizophrenics and process patients was associated with a restriction of attention, whereas the hypo-arousal of acute and reactive patients gave rise to a breakdown of selective and inhibiting functions which resulted in a flooding of the information processing system. As the relationship

between arousal measures and clinical states is still confusing, it has been argued that such formulations are premature (Maher, 1972). Nonetheless, neither the process-reactive nor the paranoid-nonparanoid dimension appears to be independent of chronicity. It is, however, the nature of the relationship between these two dimensions which requires clarification. While some arousal studies (for example, Lapidus & Schmolling, 1975) and Silverman's (1964a & b) work suggest a congruence between these two categories, Davis, Cromwell & Held (1967) have argued that they are not overlapping.

An important question at this stage would seem to be whether these subgroup findings are specific to schizophrenia or whether they should be attributed to factors shared by other psychiatric patients, for example, the acute state of symptom manifestation. The answer can be sought by studies which compare remitted with symptomatic patients. As very few studies have deliberately contrasted these states, the results are equivocal. For example, Wohlberg & Kornetsky (1973), using a continuous performance test, found that remitted schizophrenics, off medication, performed significantly poorer than normals. On the other hand, overinclusion and idiosyncratic thinking have been found to be more related to the acute state per se, rather than to schizophrenia in particular; that is, other psychiatric groups have also been shown to display this kind of thought disorder on admission (Schwartz, 1967; Harrow, Harkavy, Bromet & Tucker, 1973).

The investigations of cognitive deficits in subgroups of schizophrenics have not resulted in many consistent findings. As Callaway (1970) remarked: "The subject of schizophrenia is responsible for a fast growing but increasingly indigestible mass of clinical descriptions and experiments. Many of these data are valuable, but some conceptual scheme for ordering and organizing these observations would be helpful" (p.193).

8.3 CURRENT THEORIES OF SCHIZOPHRENIC IMPAIRMENT

Many theories have been put forward to account for schizophrenics' "psychological deficit". To single out a few theories for more detailed examination than others would seem unjustified in view of the wealth of evidence each theorist can marshall for his own view. However, several reviews have indicated greater internal consistency, greater heuristic value and more evidence for some theories (Mc Ghie, 1969; Magaro, 1974; Nuechterlein, 1977a & b). Secondly, to quote, "In an area where so much has been written by so many with possibly so little effect, it is necessary to simplify" (Hamilton, 1979, p.389). For these reasons, Broen & Storms' theory, a broad interference theory and Yates' processing capacity theory will be explicated. More recent evidence reflecting on the validity of these views will be dealt with in Chapter 9. However, an attempt will be made to put theories not included in this review, into some perspective at the end of this section.

8.3.1 Broen & Storms : Collapsed Response Hierarchies Theory

An earlier form of this theory can be discerned in Mednick's views (1958) on stimulus generalization. He proposed that schizophrenics were in a heightened drive state, and this, in itself, produced disruptions in thinking and associations. This high drive level caused a flattening of the response hierarchy, so that all responses had an equal probability of occurrence. In addition, Mednick's theory was based on the assumption of a precipitating, fear-arousing event which elicited secondary anxiety and compounded the initial heightened drive state. The resulting stimulus generalization caused many stimuli, including thoughts, to take on fear-producing qualities. The vicious circle so created could only be escaped by the maintenance of distant thoughts, remote from the initial fear and its generalized concomitants. These distant thoughts, Mednick believed, were evident in the bizarre associations of the chronic schizophrenic patient. Although many critiques have exposed the weaknesses in Mednick's formulation (for example, Venables, 1964; Broen, 1968),

it did predate Broen & Storm's reliance on a Hullian framework for the construction of their theory.

Broen & Storms (1966, 1967), Storms & Broen (1969) and Broen (1966, 1968, 1973) used response and habit hierarchy constructs, interacting with drive, to explain the schizophrenic performance deficit. Briefly stated, the theory assumed no qualitative differences in the response hierarchies of normal and schizophrenic individuals, but proposed that there were differences in the strength of dominant versus competing responses in the two groups. It was argued that in schizophrenics, as compared to normal individuals, there was little difference in strength between appropriate and inappropriate responses. The increased drive, or general level of arousal of the schizophrenic was thought to cause an increase in the response tendency of competing responses until they equalled the strength of the dominant responses. Broen & Storms introduced a response ceiling as a construct to account for the breakdown in the hierarchy; when the dominant response reached ceiling level, the only effect of increased drive would be to increase the strength of competing responses.

In comparison to other theories of schizophrenic impairment which tend to treat the response system as a dependent variable which is affected by various perceptual, attentional or conceptual constructs, Broen & Storms emphasized the role of the response system itself. However, as Magaro pointed out, they did not ignore attentional and other processes, but rather "Broen subsumes such processes under the category of one response which follows the same principle as other observable responses" (1974, p.191). In comparison to interference theories, Broen & Storms emphasise the large number of competing responses (Mc Guire, 1975). For these reasons, this formulation is often referred to as an output versus an input theory, even though such a separation is obviously not fully justified.

The following are some of the predictions that can be made from

this theory: increasing impairment with increasing complexity, that is, when competing responses are elicited by the stimulus situation; increased attention to extraneous stimuli, wide-ranging distractibility and distraction effects across modalities in acute patients. In chronic patients, a defensive strategy to cope with disorganization would result in narrowed attention, even to the extent of limiting input to one sense modality. As a result distraction effects would only be evident when the distraction occurred in the same modality as the stimulus. In some senses, the predictions involving distraction are not very different from those that are generated by interference theories. This similarity led Nuechterlein (1977a) to describe the theory of Broen & Storms as an elaboration of a selective filter dysfunction theory. Nuechterlein proposed that choice reaction time offered a method for examining the effects of stimulus and response factors, and thus enabled one to discriminate between the predictions of the two theories.

One limitation of the theory, when it is contrasted with Cromwell's formulation, is that Broen & Storms' work has been limited largely to chronic patients, although they have given some attention to acute-chronic differences. These theorists have not specifically related their theory to other subgroup classifications (Hamilton, 1976).

8.3.2 Interference Theory

In essence this theory incorporates a group of views which attempts to explain three related observations of the behaviour of schizophrenics: that they show insufficient focus on relevant aspects of stimulus situations, susceptibility to the distraction of irrelevant stimuli, and an inability to easily defocus attention when necessary (Karras, 1973).

Although Shakow's work spanned half a century and ranged widely from quasi-psychodynamic views to hypotheses generated by rigorous experimental work, he can be seen to have been one of the major

interference theorists. Employing the construct of segmental set, he concluded that schizophrenics were unable to maintain a major set, being distracted by minor sets which were elicited by irrelevant aspects of the stimulus situation (1962, 1963). One prediction that follows from Shakow's theory and which is similar to the Broen & Storms view, is that the greater the complexity of the situation or the more extraneous stimuli allowed in, the greater will be the observed deficits. The limitation of Shakow's work, like that of Broen & Storms, is that it was largely restricted to investigations of chronic schizophrenics.

Another major influence in the evolution of interference theories was the development of the concept of overinclusion (Cameron, 1939). By 'overinclusiveness', Cameron referred to a tendency to include, in conceptual thinking, many things that normal individuals typically exclude. Payne (1961) extended the concept of overinclusion to encompass perceptual and attentional behaviour and later introduced the notion of a filter, or a mechanism which functioned to screen out irrelevant perceptual data (1966). He proposed that a breakdown in this hypothetical filter mechanism was the cause of the schizophrenic's vulnerability to irrelevance and distraction. Relating the concept of overinclusion to subgroups of schizophrenics, Payne speculated that paranoid, acute and reactive patients would tend towards overinclusion, whereas process patients would tend towards overexclusion. However, Payne himself "pointed to the lack of knowledge about the interrelationship of the various techniques used to measure overinclusion as the barrier to its further usefulness" (Salzinger, 1973, p.54). In addition to this criticism there have been several studies demonstrating that overinclusion is not specific to schizophrenia, and may be a function of trait anxiety instead (Harrow, Tucker & Shield, 1972).

In its most recent form, interference theory is best represented by Mc Ghie, Chapman and their co-workers (Mc Ghie, 1966; Lawson, Mc Ghie & Chapman, 1967; Boland & Chapman, 1971). They hold a position similar to that of Payne, and have acknowledged their

debt to Broadbent's notions of a limited capacity channel and a filter mechanism. Their initial focus on an attentional dysfunction emerged from clinical material they collected on the early experiences of schizophrenics. They envisaged the defect in attention as being an inability to focus selectively on relevant material and to inhibit distraction. This was seen to be the fundamental deficit in schizophrenia which led to secondary symptoms, such as social withdrawal. Much of their experimental work concentrated on the effects of distraction, with the assumption that the inability to filter out irrelevant material gave rise to an information overload in the system. In their earlier studies they saw task complexity as one of the parameters determining the deleterious effects of distraction. However, in later work they gave more prominence to cross-modal effects and distraction, arguing that schizophrenics were more affected by distraction when the relevant material was presented in the visual modality than when it was auditorily presented. They explained this phenomenon by recourse to findings which showed that "visual data are usually recoded into the auditory modality before storage. This recoding process appears to impose a further strain on the already overburdened capacities of the schizophrenic" (Mc Ghie, 1966, p.284).

In general, interference theorists share the belief that schizophrenics suffer from a defect in voluntary attention; manifested as an inability to distinguish the relevant from the irrelevant, and an excessive vulnerability to distraction. A breakdown in the selective filter is thought to be the central mechanism involved. The similarities among the views of interference theorists should be quite clear, there being only minor differences in terminology and focus.

8.3.3 Processing Capacity Theory

Working very closely from Broadbent's (1958) model, Yates (1966b) proposed that the primary deficit in schizophrenia was "the abnormally slow rate at which information in the primary

channel is processed" ... "so that the amount of stored information lost per unit time will be much greater than in normals" (p.107). Over time, Yates believed, this would lead to a deterioration in higher mental processes, "with the appearance of language disturbance and other indices of 'thought disorder'" (p.107). At about the same time, Moyra Williams also suggested that slow information-processing was one factor which differentiated schizophrenics from normals (1966, in Reed, 1970).

Yates argued that experimental work up to that point had not been able to specify at which of four possible points breakdown occurred; that is, whether it was peripheral, organizational (data-processing unit), central, or motoric. Yates proposed that "the peripheral, and central processing units and the effector processes are unimpaired in schizophrenia, and that the basic defect lies in the initial data processing system" (p.126), that is, at the initial organizational level. Despite the apparent certainty of this statement, Yates did acknowledge that the defect could also possibly lie elsewhere, for example, on the response side (p.104) or at the initial receptor level (p.105).

One advantage of Yates' theory is that he did not have to have recourse to a hypothetical filter mechanism, as did Payne and Mc Ghie (Wishner & Wahl, 1974). The weaknesses of theories relying on such a filter will be discussed in Chapter 9 of this thesis. Disregarding the mechanisms employed by the two theories, in both cases the outcome would be the same: a limited-capacity short term storage system would become overloaded, leading to the loss of relevant information (Ortof, 1969). A prediction that could be made from both theories is that the processing defect could be overcome if material was presented at a sufficiently slow rate. A second point on which Yates' theory differs from that of Mc Ghie and Chapman is his emphasis on the slow processing of relevant information, while Mc Ghie and Chapman stress the intrusion of irrelevant stimuli. That is, the Mc Ghie & Chapman theory holds that a lack of effective screening to exclude irrelevant material results in the overload; Yates, on the other

hand, held that it was the slowness of processing which caused the overload with the consequent loss of appropriate information.

Yates suggested the technique of dichotic stimulation as a means of testing his theory in that it provided an opportunity to assess the functioning of the primary processing system and the short term memory store; the transition from the one to the other being the measure of the speed of processing (1966, p.108). However, those investigators who have employed this technique have tended to include distraction as part of the task (for example, Korboot & Damiani, 1976). This method would seem appropriate for testing only the emphasis Mc Ghie et al place on the deleterious effects of distraction. There do not appear to have been many studies which have employed free recall, a method better suited to assessing speed of processing per se.

In terms of subgroup differences amongst schizophrenics, Yates speculated that his slow processing hypothesis could probably best account for the performance of nonparanoid schizophrenics. Yates did not, however, offer any reasons why this subgroup of schizophrenics, in particular, should be thus affected.

A number of other views have been put forward to account for the impairment in the performance of schizophrenics. For example, the "disattention hypothesis" (Cromwell & Dokecki, 1968) which stated that schizophrenics lack the ability to disattend, which renders them unprepared to attend to new, relevant stimuli. In an attempt to explain their vulnerability to distraction, Salzinger (1971, 1973) proposed "immediacy" as the dominant eliciting factor of schizophrenics' behaviour. Holzman (1969, 1970), on the other hand, saw the proprioceptive and autonomic feedback systems as leading to the slow, and therefore seemingly impaired, performance of schizophrenics.

The views of Venables (1964) and Silverman (1964a & b, 1967) are of special interest because, as we have seen, they both specifically relate their theories to subgroup classifications. For example,

Venables, basing his theory on an arousal-attention relationship, proposed that chronic (and possibly process) patients were in a state of heightened arousal which led to narrowed attention and restricted cue utilization. Acute (and possibly reactive and paranoid) patients were unable to restrict the range of attention and were therefore flooded by information (Ludwig & Stark, 1973). Aside from its basis in neurophysiological process, Venables' formulation is similar to interference theories in its reliance on a filter mechanism which fails to screen out irrelevant stimuli.

Silverman, on the other hand, based his theory on "attention response dispositions", or cognitive styles. "They are definite internal systems which have been learned and are independent of external stimuli" (Magaro, 1974, p.187). The underlying premise of his theory has much in common with the views of Cromwell; that is, individual differences in sensory regulation are thought to be instrinsically related to cognitive functioning and therefore to psychopathology. Relying on prior work on cognitive controls, Silverman used the three-type classification system for describing characterological responses to sensory input: augmenters, moderates and reducers. The behaviour of schizophrenics was therefore interpreted as an exaggeration of a trait variable, rather than as a state variable. That is, these styles of cognitive behaviour were seen to represent characteristics of the person who became schizophrenic rather than characteristics of the state 'schizophenia' (Otteson & Holzman, 1976). In the scheme proposed by Silverman process, chronic and nonparanoid patients are classified as reducers, whereas reactive, acute and paranoids are augmenters. Silverman proposed that measures of scanning and field articulation were appropriate for differentiating the cognitive types. Although Silverman's "gating mechanism" for regulating intake has much in common with the selective filter, mentioned earlier, he differed from other theorists in that he saw the schizophrenic as active in his attentional behaviour, rather than as passively overwhelmed by stimulation (Yates, 1966a).

In conclusion, although the theories reviewed appear to differ in

terms of their proposed mechanisms and loci of dysfunction, there is remarkable congruence amongst them with regard to their emphasis on: the disruptive effects of complexity, the failure to inhibit competing distractions, the vulnerability to irrelevance, and the existence of subgroup differences. Many writers agree that a distinction should be made between a group of schizophrenics which shows widened attention and a group which exhibits narrowed attention. However, it is the differences between the views which give rise to confusing and conflicting results. "It could be said that each theory has its own set of confirmatory data developed from the use of dependent variables which are usually quite different from another theorist's interest and explanation. In effect, each theorist develops a specific experimental operation which discriminates between the performance of schizophrenics and other groups and at the same time defines a theoretical construct with psychological or physical referrents to explain the schizophrenic deficit" (Magaro, 1974, p.151).

8.4 CROMWELL'S THEORY OF STIMULUS REDUNDANCY

Cromwell and his co-workers had found that, while good-premorbid paranoid patients underestimated size, poor-premorbid nonparanoid patients tended to overestimate (Davis, Cromwell & Held, 1967). This was consistent with the earlier studies of Harris (1957) and Silverman (1964a & b). They followed this work by pursuing one potential explanation for nonveridical size estimation; that is, the idea that eye-movement patterns led to extensive or minimal scanning with overestimation (Silverman, 1964a & b). Under two conditions of exposure, 10 seconds and 100 milliseconds, Neale & Cromwell (1968) found that only poor-premorbid nonparanoid schizophrenics showed greater size-estimation deviations under the longer exposure condition. This made an eye-movement explanation untenable because good-premorbid paranoid patients showed their greatest errors in the 100 millisecond condition, where no opportunity for repeated visual fixations was present. Neale & Cromwell interpreted this finding in terms of a construct proposed by Pribram; that is stimulus redundancy. "According to this

construct, size-estimation level increases as a function of the redundancy level of the field in which it is presented. Redundancy may be achieved by either temporal or spatial repetition of homogeneous or unchanging stimulation" (Neale & Cromwell, 1968, p.48). On the basis of this construct Neale & Cromwell offered an explanation of their findings which formed the basis of the stimulus redundancy theory: "different subgroups of schizophrenics differ from normals in their base-line redundancy levels. The poor-premorbid nonparanoid schizophrenic may be hypothesized to have a high redundancy level. The good-premorbid paranoid schizophrenic may be hypothesized to have a low redundancy level. Differences in scanning behaviour may be hypothesized as one, but not the only mechanism for maintaining these levels" (p.48).

The model of redundancy on which the theory relied was originally elaborated by Pribram & Melges (1969) in terms of a neural programme or plan for maintaining the stability of the organism. Incongruency, or instability, would arise, or be signalled, by arousal. Two processes for accomplishing a stable state of congruity could be described. Firstly, preparatory processes, which were internal stabilising strategies for eradicating perturbation by the exclusion of input; and secondly, participatory processes, which functioned to deal with incongruity by increased searching and sampling of input. "In terms of information measurement theory, these emotional processes effect a subtle balance between maximum redundancy, through preparation, and maximum information density, through participation" (p.325). Maladaptation was thought to result from excessive reliance on either one of the processes. The suggestion offered was that preference for one of these two processes would be determined by previous experience; that is, styles of excessive participation or excessive preparation were learnt. In Cromwell's theory, the nonparanoid-process patient 'prepares' excessively and cuts down on input to maximise redundancy. The reactive-paranoid 'participates' by excessive search in order to minimise redundancy. The formulation has obvious parallels with former views of restricted and extended attentional behaviour. Findings of a preference for

stimulus deprivation among process patients was interpreted as corroborating the theory (Mehl & Cromwell, 1969).

Although Cromwell conceded that the relationship between redundancy and information processing was unclear, he ventured a definition of redundancy in terms of speed of processing. That is, high redundancy individuals would be slow processors of information, whereas low redundancy individuals would process information at a fast rate. In two later papers (1972, 1975) Cromwell elaborated the concepts of high and low redundancy schizophrenics, extending the theory in two important ways. Firstly, he assumed that findings which had resulted from differentiating process and reactive schizophrenics could be applied to the high and low redundancy grouping. Secondly, he added the formulations of other writers to the redundancy construct, arguing that high redundancy schizophrenics were minimal scanners and showed patterns of under-inclusion, whereas low redundancy schizophrenics were extensive scanners, showing patterns of overinclusion (1972, p.130-131).

Cromwell's theory is unique in terms of the specificity of the predictions that can be made from the theory, and in terms of a full integration of subgroup classifications with processing styles. That is, process and/or nonparanoid patients (high redundancy) should process information at a slow rate and show evidence of a narrowing of attention. In the present study the following issues were addressed:

- to what extent is Cromwell justified in conflating the process-reactive classification and his high redundancy subgroups?
- do high and low redundancy schizophrenics differ in terms of the speed at which they process information?
- do high and low redundancy schizophrenics differ in terms of the extensiveness of their attention?

Cromwell's theory of stimulus redundancy can be examined in more detail by exploring some of the premises on which it is based.

8.4.1 The Heterogeneity of the Schizophrenias

This topic was dealt with in detail in the first part of this work. Cromwell's theory assumes the existence of at least two reliably discriminable subgroups of schizophrenias. These groups are thought to differ in terms of developmental factors, characteristics of the breakdown, prognosis and cognitive functioning. Cromwell supposed that the process-reactive distinction provided the necessary subgroup differentiation, and he predicted that process and reactive schizophrenics would differ in cognitive behaviour in a manner consistent with the redundancy formulation.

Work on the process-reactive, acute-chronic, and paranoid-nonparanoid dimensions has been directed at establishing the means for reliable subgroup identification. Although the idea of subgroups was inherent in Kraepelin's description of dementia praecox, no definitive classification has yet emerged. However, there is considerable agreement that dimensional approaches appear to offer the most promising avenue for exploration. Psychophysiological studies seem to point to the existence of differences between subgroups of schizophrenics (Lynn, 1963; Ward & Carlson, 1966; Lapidus & Schmolling, 1975). But no clear correspondences between physiologically distinct subgroups and any of the major dimensions have been established (Gruzelier & Venables, 1975).

While few would dispute the heterogeneity of the schizophrenias, the search for consistent indices of identification has so far produced only inconclusive and ambiguous results. Further, it was the conclusion of the author (see Chapter 7) that the process-reactive dimension was unlikely to provide a sufficient basis for distinguishing schizophrenics on information processing tasks.

8.4.2 Self-Regulation of Input

Based on the theoretical model of Pribram & Melges (1969), Cromwell stated that "rates of processing of external stimulus information are determined not only by the availability of such

information but also by controls within organisms" (1975, p.600). This idea, as it pertains to the development of psychopathology, had also been expressed by Miller (1960) in his concepts of information underload and overload. A similar construct, that of a 'stimulus intensity control mechanism' formed the basis of Silverman's hypotheses regarding the cognitive styles of augmenters and reducers (Buchsbaum & Silverman, 1968; Schooler & Silverman, 1969; Ludwig, 1971, 1972; Ritzler & Ebner, 1973). Essentially, one group of patients is seen to be acutely aware of minimal intensity stimulation and hyperreactive to marginal, irrelevant and ordinarily disregarded aspects of stimulus fields, whereas another group of schizophrenics is thought to reduce the intensity of incoming information. These ideas have much in common with the Pribram & Melges' formulation. Ludwig (1972), drawing on the work of Lindsey, Berlyne and Petrie, suggested that "These theories propose that there exists for man an optimal range of stimulation or activation, with stimulus input above or below that range leading to a disorganization of his psychological functioning" (1972, p.114).

A limited number of studies have investigated the extent to which schizophrenics, or a particular subgroup of schizophrenics, can be seen to have a preference for complexity, or a style characterized by stimulus-seeking, in line with Cromwell's description of low redundancy behaviour. There is ample evidence for high redundancy modes of processing among schizophrenics, who characteristically appear to prefer low levels of input. For example, Sidle, Acker & Mc Reynolds (1963) investigated the need for novelty and variability among schizophrenics, hospitalized nonschizophrenics and normals, and found that schizophrenics scored lower on a test of stimulus-seeking behaviour. Neale & Cromwell (1969) assessed the extent to which subgroups of schizophrenics showed a preference for complex rather than simple geometric shapes and found that both good-premorbid paranoids and poor-premorbid nonparanoids showed a preference for the least complex shapes; a finding opposed to the prediction made by stimulus redundancy theory. In two studies designed to measure

the need to change the nature and amount of sensory input, Ludwig (1972) and Ludwig & Stark (1973) confirmed the findings of the two previously mentioned studies; that is, schizophrenics tend to avoid sensory extremes. While there might be wide acceptance of the principle underlying theories based on self-regulation of sensory input, no studies have yet produced evidence to support Cromwell's hypothesis regarding a low redundancy group of schizophrenics.

8.4.3 Stimulus Redundancy as Rate of Processing

Cromwell suggested that the rate of processing of information may be one index of an individual's redundancy level. In this sense he can be seen to have extended Yates' processing capacity theory, by proposing that one group of schizophrenics processes information extremely slowly (high redundancy), while another group processes information at a much faster rate (low redundancy). In this study, Cromwell's hypothesis regarding rate of processing was subjected to empirical evaluation. The theoretical adequacy of his assumption of equivalence between redundancy level and rate of processing will be examined in a later chapter.

S E C T I O N T H R E E

CHAPTER 9 - INFORMATION PROCESSING AND SCHIZOPHRENIA

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SECTION THREE

CHAPTER 9 - INFORMATION PROCESSING AND SCHIZOPHRENIA

The major assumption of information processing approaches is that perceptual and cognitive activities can be construed or represented as a series of transformations of information; that is, the scheme adopted is one of a series of temporally-based operations. The major impetus of the approach is to "make explicit the operations, stages or processes that occur in the time between stimulation and the observed response" (Haber & Hershenson, 1973, p.158). Inherent in the approach is the assumption of limitations within the system, and the necessity for some type of selectivity.

Simon (1979) made a distinction between complex and elementary information processing approaches. He saw the former as involving computer models of complex processes, such as problem-solving, rule-induction and language. However, limited exploration in the field of psychopathology has taken place, the exception being a computer model of paranoia. On the other hand, the elementary information processing approach, which has been given much more detailed attention, is centrally involved in identifying the structure and operation of the short-term memory system. Or, as Simon puts it, "the interface between cognition and perception" (p.385). These processes have more often been represented as flow diagrams than as computer models. It is this elementary information processing approach which commands current interest in the field of psychopathology. And it is within this paradigm that the information processing capacities of schizophrenics have begun to be investigated.

Earlier it was stated that information processing models accepted that the processing system was limited and that some type of selectivity was necessary. Two of the cognitive theories of schizophrenia, reviewed in Chapter 8, have attempted to locate the schizophrenic deficit in terms of a model which articulated the

notions of system limitations and selection. The interference theorists, with their concept of a selective filter, and Yates' slow processing theory, both rely explicitly on Broadbent's (1958) model. Indirectly, Cromwell's theory, as it emerged from Yates' views on the rate of processing, is also derived from the Broadbent (1958) model. A number of recent papers have reacted critically to this reliance on a single, rather tenuous, model (Marshall, 1973; Hemsley, 1975; Schneider, 1976).

9.1 BROADBENT'S (1958) MODEL

Briefly stated, Broadbent's earlier model proposed a brief, initial short term storage system (congruent with an echoic or iconic store), which he called the buffer store or S system. It was thought that certain information would be selected from this store by the filter and serially processed through a limited capacity channel or P. As information could be held in the S system for only very brief periods, and given the limitation of serial processing in the P system, information from the S system could be lost, in addition to being filtered out (Broadbent, 1958).

In this early model, the filter was assumed to select on the basis of the physical properties of stimuli; that is, selection was hypothesized to take place at a very early stage of processing. However, the findings that semantic aspects of supposedly unattended messages could affect a subject's behaviour challenged the idea of an early, all-or-none selection process (Gray & Wedderburn, 1960; Schneider, 1976). Treisman (1964 in Schneider, 1976) proposed a modification of this early filter theory and argued that the filter actually operated like an attenuator to reduce the intensity or discriminability of incoming stimuli. In this model, even though the filter reduced the impact of incoming stimuli, they still had some probability of influencing the response.

Broadbent (1971) updated his information processing model in the light of the new evidence and gave more weight to response selection processes by distinguishing between filtering and pigeon-holing.

Filtering was seen as a relative process involving the weighting of inputs. Pigeon-holing, on the other hand described the process whereby the filtered input or "evidence" was linked by rules to category states determining output. By this modification, Broadbent envisaged output as being dependent on the combination of weightings resulting from filtering and pigeon-holing, each of which operated on different classes of stimulus characteristics. Hemsley (1975) has reviewed Broadbent's later model and emphasized the potential of the model for distinguishing selection and response factors.

Nonetheless, all current theories of schizophrenic cognitive deficit rely on attentional theories of a "bottle neck" type. These are theories which propound a critical point of selection and imply structural limitations in the system which determine selection. The critical point of selection may be held to be early in processing, as in Broadbent's 1958 model, or deeper in the system, as in Broadbent's 1971 model and in the model proposed by Deutsch & Deutsch (1963). Theories in the field of schizophrenia have drawn exclusively on selection models, whether input selection (for example, the interference theorists) or response selection (for example, Broen & Storms). It is unfortunate that other models, for example, the capacity limitation model of Kahneman (1973, in Norman, 1976) have been neglected in schizophrenia research. Briefly, Kahneman proposed that the amount of attention available at any one time was limited. In addition, further limitations could result from the available capacity being deployed in other activities. In support of the spirit of Hemsley's (1975) review, research in schizophrenia should not be limited to only one of the many available models of attention.

Despite its possible shortcomings, however, Broadbent's theory of 1958, and the hypotheses pertinent to schizophrenia which have been based on it, have served as points of departure for many of the recent studies of the information processing capacities of schizophrenics.

9.2 A REVIEW OF RECENT EVIDENCE

As the literature on schizophrenia is vast, any review must be selective, and the terms of selection should be made explicit. The studies included in this review have, with a few exceptions, been published after 1970, since a summary of work prior to that date was given in Chapter 8. In addition, all the studies place their aim, method or interpretation in the context of the information processing paradigm, or purport to test one of the three major theories referred to earlier, either that of Broen and Storms, Chapman and Mc Ghie, or Yates. Also included are studies which are pertinent to Cromwell's stimulus redundancy theory, particularly studies of the direction of effects he has predicted: fast processing and extensivity of attention amongst low redundancy (paranoid and/or reactive) schizophrenics. Altogether, fifty seven individual studies were found which met these criteria; some of these studies will be referred to here, but some will be included in the final discussion (see Chapter 12). The author cannot claim to have included all the relevant studies, although every attempt was made to be as inclusive as possible. In order to structure the discussion, the review will take the form of answers to several pertinent questions.

9.2.1 Has a Defect in the Information Processing Capacities of Schizophrenics Been Established?

That such a question should be posed is somewhat of an indictment of the progress made since 1970, since 10 years or more have passed since information processing models have been applied to thinking about the impairment of psychological functions of schizophrenics. As Asarnow & Mac Crimmon (1978) observe: "Investigations of attention - information processing in schizophrenics make the assumption, almost always implicit, that the impaired performance of schizophrenics is a direct, behavioural manifestation of schizophrenia. Only by making this assumption can one make inferences about schizophrenia on the basis of the performance of schizophrenics on laboratory tasks" (p.597). And yet, as they concede, there is growing criticism of this

assumption since someone who is said to be suffering from schizophrenia is also an individual who partakes of a highly particular social world in an institution, is subjected to reduced sensory and social stimulation, actively participates and manipulates a sick role, etc.

In an insightful review, Saccuzzo (1977) raised a similar issue in noting the parallels between impairment in schizophrenics as compared to normals and the impairment in the elderly as compared to the young. He argued that it was important that a distinction be made between performance effects that are a unique result of the schizophrenic process and those that are attributable to general deterioration.

These criticisms make the inclusion of appropriate control groups in studies of schizophrenics imperative. Of the studies included in this review, only one half included a nonschizophrenic psychiatric control group, while a few studies (five) used other groups suited to controlling for the effects of institutionalization, such as convicts and medical patients.

The results of a number of studies stress the importance of appropriate control groups. For example, Kopfstein & Neale (1972) used five tasks designed to measure attention to assess 120 patients, equally divided into acute and chronic schizophrenics and psychiatric controls. They found no differences among any of the groups. Besides concluding that the five attention tasks - reaction time, size estimation, object sorting, Benjamin proverbs and a test of vigilance - had little in common, and that a more specific definition of attention was required, they also pointed to the need for studies to show that schizophrenics differed from other hospital patients and not just from normal controls. Karras (1973), using an auditory reaction time method, found that schizophrenics were simply slower than depressive and mixed character-disordered and neurotic patients. He concluded that there may be no single clue to the schizophrenic deficit, and that results from study to study might differ

depending on what kind or group of schizophrenics was included in the investigation.

There is, as yet, no clear answer to the question of whether a defect in the information processing capacities of schizophrenics has been established. A large number of studies have failed to find significant differences between schizophrenics and controls. Examples of such findings are given below:

- Ritzler & Ebner (1973), compared the performance of acute and chronic schizophrenics and normals and found that contrast variables produced similar directional effects on a kinaesthetic figural after-effects task in both normals and schizophrenics. They also stressed the need for studies to include psychiatric control groups.

- Using two digit-span and two word-span tests with neutral and distractor conditions, Oltmanns (1978) found no difference between the effects of distraction on manics and schizophrenics. He concluded that the observed impairment was not specific to schizophrenics and demonstrated an inefficiency in, but not an inappropriateness, in coding.

- Koh & Peterson (1978) used incidental recall in a study of schizophrenics, psychiatric controls and normals. They manipulated memory coding at four levels: by letter, rhyme, meaning and sentence similarity. They found that deeper coding, in the Craik & Lockhart sense of being more semantic (1972), improved the performance of schizophrenics and normals in the same way.

- Testing the span of apprehension with a simultaneous measure of arousal, Spohn, Thetford & Cancro (1970) and Spohn, Thetford & Woodham (1970) found that although the span of attention of schizophrenics was lower than that of normals, schizophrenics' span increased with increased exposure at the same rate as normals but at a lower level. Also using span of apprehensions,

but differing from the former study in terms of including a psychiatric control group and manipulating noise-signal similarity, Davidson & Neals (1974) found that schizophrenics were affected by this manipulation in the same way as normals. They concluded that there were no qualitative differences between the groups in terms of their search strategies or processes. Russell & Page (1976), in a similar study, varied display size, signal-noise ratio and measured response time. They found that although normals responded faster, display size affected schizophrenics and normals in the same way. They concluded from this, and from the error rate in both groups, that schizophrenics did not show inferior visual information processing abilities as compared to the normal group. In a related study (Russell & Knight, 1977), in which display and noise load were manipulated, normals were again found to respond quicker than schizophrenics. However, no significant normal-schizophrenic differences were found and the authors concluded that schizophrenics were "following much the same feature extraction strategies" (p.19) and "seemed likely to follow much the same categorization and checking operations as the controls" (p.21). Extending this work by requiring visual search matching to be made from memory sets, Russell, Consedine & Knight (1980) again confirmed the slower response times of schizophrenics and the similarity between the performance of schizophrenics and normals. They concluded that both groups "employed similar speed-accuracy trade-off strategies as task demands increased" (p.113). Koh, Szoc & Peterson (1977) in a study of schizophrenics, psychiatric and normal controls found, in a similar reaction time study requiring matches to be made from memory, that schizophrenics appeared to use the same short-term memory scanning and recognition processes as the other two groups.

- In an attempt to clarify the "filter hypothesis", Hemsley & Zawada (1976) compared the effects of pre- and post-instruction on a dichotic stimulation task with male and female voices. Although they found that normals benefitted from instructions,

there were no significant differences between depressives and schizophrenics. They interpreted these findings as an indication that the impairment was related to severity of illness, and that the impairment was not specific to schizophrenia. In another study Hemsley (1976a) compared the choice reaction times of schizophrenics and depressives on a card sorting task, with and without distraction. Although he found that schizophrenics were slow under all conditions, they were no more affected by distraction than the depressives.

- From a series of studies requiring an intelligibility response to simultaneous voice messages, Rappaport et al concluded that "schizophrenics are processing competing auditory information much like normal subjects but are doing so less efficiently" (Rappaport, Rogers, Reynolds & Weinmann, 1966, p.23).

- On a probability learning task, Johnston & Bursill (1973) could find no differences between schizophrenics and normals, except to confirm earlier reports of a general slowness in the responses of schizophrenics.

- Straube & Germer (1979) used a shadowing task with and without distraction, and varied the content of the distraction from neutral words to semantically similar words to affective words. They found no significant shadowing differences between newly admitted schizophrenics, neurotics and normals. All were equally affected by distraction and by affective distraction.

A substantial number of studies, therefore, confirm the slowness of schizophrenics' performance, but without establishing qualitative differences between the functioning of schizophrenics and other groups. The manner in which the general slowness of schizophrenics is interpreted differs from study to study and a number of these possibilities will be explored in the discussion to follow. Of course, some of these negative findings may be artefacts of methodological problems, such as the sample studied and the type of task used. For example, in the Straube & Germer

(1979) study, referred to earlier, the sample consisted of 24 newly admitted schizophrenics, 24 neurotic inpatients and 24 normal controls. The authors state that they excluded 31 schizophrenics from the study for reasons such as refusal, inability to participate, low vocabulary scores and early release from hospital. The remaining patients, who were included in the study, were therefore rather atypical. There were also wide variations in the types of tasks used to assess information processing, which was one of Marshall's reasons for advocating that traditional conceptual tasks be abandoned. He argued that "since much of research interest focuses on the information processing capacities of schizophrenics, it would be well to use more direct tests of such abilities" (1973, p.431)

The studies quoted either did not find any differences between the performance of schizophrenics and controls, or found only that schizophrenics were slower than the controls on the experimental tasks. However, the finding of overall slowness is rather nonspecific. For example, the finding of Friedrich, Emery & Fuller (1974): they used associated and unassociated word lists presented dichotically at different rates and found that although paranoid schizophrenics employed the optimal strategies of recall for each condition, they used them less often and less accurately than normals. Kornetsky & Orzack (1979) stated that: "Schizophrenic patients usually perform poorer than normal subjects on most behavioural tasks. It is our contention that many of the behavioural deficits seen in the schizophrenic can be accounted for by a primary attentional disorder and/or general lack of interest by the patient in playing the psychological games of the investigator" (p.69). Findings of a generalized or nonspecific deficit are not sufficient to discount the possibility that schizophrenics are not as motivated as other groups which are tested.

Notwithstanding the large number of findings of such a "generalized deficit", some studies have been able to establish qualitative differences between the performance of schizophrenics

and other groups. The work on remitted schizophrenics is of particular interest here. The Wohlberg & Kornetsky (1973) study, referred to earlier, in which they found an attentional dysfunction in remitted schizophrenics, was replicated by Asarnow & Mac Crimmon (1978), who concluded that the schizophrenics' performance on a span of apprehension had much in common with that of children at risk. They felt that a possible "marker" of schizophrenia had been found. Spohn et al (1970) also found lowered span, but felt that the importance of this finding was diminished by the increase in the span of schizophrenics with increased exposure in a similar pattern to that of normals. Neale et al found that schizophrenics' span of apprehension was half that of normals (Neale, Mc Intyre, Fox & Cromwell, 1969), and Neale (1971) again found reduced span; in both these studies, however, the decrease in span was most evident when noise was introduced. There appears, then, to have been some consistency in the finding of reduced span amongst schizophrenics.

Other studies of particular interest are those which demonstrate differential deficit; that is, unimpaired performance of schizophrenics at one level of the task with deterioration in performance occurring as a result of increased complexity or distraction. For example, in an attempt to investigate whether schizophrenics could separate a target from noise on the basis of configural stimulus attributes, as do normals, Schwartz-Place & Gilmore (1980) found no difference in the performance of schizophrenics and drug-abusers under the no noise condition. However, the performance of schizophrenics deteriorated considerably more than that of the controls when noise was introduced. Similar findings have been reported by: Wishner & Wahl (1974) who tested fast and slow shadowing on a dichotic task, with and without distraction; Payne, Hochberg & Hawks (1970) who assessed shadowing with and without distraction; and Hirt, Cuttler & Genshaft (1977) who found equality of performance between experimental groups on a simple level task but deterioration in the schizophrenics' performance with increased complexity. The findings of workers such as Marshall (1973) cannot be included here, because although

he found that complexity resulted in deleterious effects on performance, the initial level of performance of schizophrenics was lower than that of other groups to begin with. Increasing task requirements in such an instance may not give an indication of differential deficit, but may simply compound an initially low level of achievement.

In conclusion, although a number of studies have failed to confirm a defect or dysfunction in the information processing capacities of schizophrenics, the studies on span of apprehension and those that employ the systematic manipulation of distraction or complexity appear promising. It is difficult to avoid feeling, however, that some research has leapt ahead to explore higher level constructs when more basic issues have not yet been fully resolved. For example, Bull & Venables (1974) found that, in comparison to a mixed psychiatric and normal group, schizophrenics had impaired speech perception. They argued that this "means that on any task in which the perception of spoken material is involved, the performance of schizophrenics is likely to be impaired. As a result of this finding the various reports of schizophrenic impairment in many areas (for example, information processing tasks, learning tasks and short-term memory) should at least be reconsidered" (p.353). While this assertion cannot be accepted uncritically, it does indicate the degree of dissension in the field regarding the existence and possible nature of the cognitive deficit in schizophrenics.

9.2.2 What is the Nature of the Deficit?

Two questions require answers: Firstly, how is the generalized deficit to be explained; that is, why do schizophrenics perform at a slower rate and lower level when compared with controls? Secondly, how do those workers who have established a particular deficit account for it? In order to provide answers to these questions on the basis of the most recent evidence, it is necessary to make a simplistic distinction between early stages of processing (peripheral, attentional, sensory), intermediate stages of processing (beyond input), and response factors. The reason

for doing so is that researchers often make this distinction in their attempts to isolate the schizophrenic deficit and in order to test one of the major theories. Mc Ghie, Chapman, Payne and other "interference-filter" theorists regard the deficit as an initial one; Yates locates it in the speed of intermediate processing, and Broen & Storms emphasise the importance of response selection difficulties.

Early stages of Processing - With regard to a possible input dysfunction, positive evidence was provided for such a view by the Bull & Venables (1974) study mentioned earlier. Nolan & Anderson (1973) interpreted the improvement of scizhophrenics' performance with overtraining on a discrimination learning task, requiring reversal and extra-dimensional shifts, as evidence of an attentional dysfunction. They did, however, note that the wide variation in the schizophrenics' scores, even when transformed, made "the evaluation of individual differences in attentional responding seem to be more meaningful than considerations of group differences" (p.34).

Rappaport (1967, 1968) attempted to account for his findings of a greater number of omission errors amongst schizophrenics by postulating discontinuous increases in auditory threshold. However, when this hypothesis was tested in a follow-up study no evidence for such decreases in auditory sensitivity could be established (Rappaport & Hopkins, 1969). Such a notion was also rejected by Korboot & Damiani (1976) who could find no differences in the detection scores of schizophrenics and neurotics on a shadowing task.

In fact, quite a considerable number of studies are interpreted as providing evidence against a primary perceptual deficit (for example, Payne, Hochberg & Hawks, 1970; Cuttler, 1973; Hemsley, 1976a; Russell & Knight, 1977). An illustrative study is that of Oltmanns & Neale (1975). On the basis of finding a schizophrenic deficit on 6- but not 5-digit strings, they concluded strong evidence against a perceptual difficulty. They argued

that if any such difficulties were present, they should have been evident on long or short strings of digits.

Of those writers who locate the deficit in the very early stages of processing, some have proposed deviant iconic storage as one possible mechanism. Rapid decay, inadequate formation and even icon persistence have been mentioned (Neale, 1971; Saccuzzo, Hirt & Spencer, 1974; Knight, Sherer & Shapiro, 1977; Saccuzzo & Miller, 1977; Steronko & Woods, 1978). In an ingenious attempt to separate assessment of the icon from possible difficulties in transfer, Knight, Sherer, Putchat & Carter (1978) used two complementary pictures which, when presented close enough in time, formed a common object. They concluded that the icon of schizophrenics was intact and adequately formed. They did suggest however, that the possibility of a lingering icon in schizophrenics should be investigated.

In conclusion, there appears to be insufficient evidence, at the present time, for an initial input dysfunction in schizophrenics. The possibility of a lingering icon was suggested by Knight et al (1978). The patients in Saccuzzo & Miller's (1977) backward masking study were still performing well at a 300 millisecond interval, a finding which prompted the authors to speculate that the icon of schizophrenics might persist beyond that of other groups. While the possibility of confounded icons in schizophrenics is appealing, longer post-stimulus intervals have been included in too few studies to provide any further enlightenment.

Intermediate Processing and Response Factors - It might be well to consider the evidence for and against Yates' slow intermediate processing theory and Broen & Storms' response selection hypothesis together, as a number of writers concede that both theories could account for their data (Marshall, 1973; Hemsley, 1976a; Koh, Szoc & Peterson, 1977). It also appears to be somewhat arbitrary to interpret the slowness of schizophrenics as either response selection difficulties (Russell & Page, 1976; Russell, Consedine & Knight, 1980) or slow processing (for example, Slade, 1971;

Cuttler, 1973; Davidson & Neale, 1974; Wishner & Wahl, 1974; Korboot & Damiani, 1976; Saccuzzo & Miller, 1977; Lerner, Nachson & Carmon, 1977). It probably depends to some extent on which author one favours, as the tasks employed do not always allow for adequate discrimination between the theories. As Marshall (1973) says: "in choosing either an attentional or a response selection model as a basis for understanding schizophrenics' problems we necessarily restrict our view. Schizophrenics may experience difficulties in either or both stimulus analysing or response selection. They may also have difficulties in holding material in the short-term memory mechanism, in retrieving memorial information, in transferring information within the system or associating at a central level" (p.414). There is no doubt that some schizophrenics perform at a slower rate and a lower level than normals on some tasks. Whether there is a unique reason for this type of performance is still debatable.

Some studies purport to find evidence against either the Yates or Broen & Storms theory. For example, Boland & Chapman (1971) concluded that schizophrenics' errors on a multiple choice vocabulary test reflected an accentuation of normal response biases. Such a result, they argued, refuted Broen & Storms' hypothesis regarding dominant responses being different in normals and schizophrenics. On the other hand, some studies claim to have produced evidence against Yates' slow processing theory. For example, Hawks & Robinson (1971) and Romney & Leblanc (1975) found that schizophrenics were not affected by the rate of presentation. Romney & Leblanc, however, employed the Bannister-Fransella grid test and it is not clear how legitimate it is to claim to have tested processing deficits on such tasks (Marshall, 1973). The present author feels that there is insufficient evidence for further clarification of the status of these two theories.

9.2.3 Are There Consistent Subgroup Differences in Information Processing?

Despite an emphasis on the importance of subgroup classification, very few information processing studies deliberately include acute-chronic, paranoid-nonparanoid and process-reactive dimensions. The paranoid dimension has been examined more frequently than the other two dimensions, and very frequently only one or the other group (for example, chronics or acutes or process) have been included. However, differences between the subgroups have often not been found (for example, Neale, Mc Intyre, Fox & Cromwell, 1969; Rappaport & Hopkins, 1969; Spohn, Thetford & Woodham, 1970; Hawks & Robinson, 1971; Neale, 1971; Slade, 1971; Postman, 1974; Knight, Sherer, Putchat & Carter, 1978); Russell, Consedine & Knight, 1980). With regard to the acute-chronic dimension, Alumbaugh concluded that the "distinction relates to a performance deficit and not to unique types of cognitive functioning" (1976, p.517). Although some writers have reported acute-chronic differences (for example, Feeney, 1972), the present author concurs with Alumbaugh regarding the limited usefulness of such findings. It is likely that chronic states of any disorder produce greater decrements in performance and such findings are unlikely to disclose unique deficits. It is important to note that the process-reactive distinction has been conspicuously underutilised in information processing research. Other subgroup differences will be discussed in the context of Cromwell's theory to the extent that his theory relates to such differences.

9.3 CROMWELL'S THEORY - RECENT EVIDENCE

As Ritzler & Ebner (1973) note, theories such as those of Silverman (and Cromwell), by positing differences between subgroups such as augmentation-reduction, fast processing/low-redundancy - slow processing/high-redundancy, imply that such groups will fall on either side of a median group. In the case of Cromwell's theory such an impression is conveyed in two ways: Firstly, the importance Cromwell gave to Harris' (1957) study, in which normals

were found not to differ in size estimation from veridicality, but process patients overestimated and reactives underestimated. Secondly, by his reliance on the Pribram & Melges model in which either extreme, participatory or preparatory processes, are seen to be maladaptive. Normality is regarded as some compromise between the two. Thus, findings of slow processing in process or non-paranoid schizophrenics would not constitute sufficient evidence for Cromwell's theory. The reciprocal prediction would also have to be found true; that is, fast processing would occur in reactive and paranoid schizophrenics.

Some evidence for Cromwell's postulates have been reported. Cuttler (1973) and Hirt, Cuttler & Genshaft (1977) found that although interference adversely affected the performance of nonparanoids, paranoids showed indications of superior processing as compared to normals under these conditions. Similarly, Nideffer & Cromwell (1972) interpreted tentative support for the theory on the basis of a choice reaction time task. Using a signal detection paradigm, Postman (1974) found that paranoids made fewer detection errors and were more sensitive than nonparanoids. The study did not, however, include a normal control group. Cegalis, Leen & Solomon (1977) found that acute patients discriminated peripheral signals more efficiently than normals, whereas chronics were worse. As the acute group of schizophrenics consisted largely of reactives and the chronics of process patients, it would seem legitimate to accept this study as corroborating the theory.

However, three studies report findings which are in direct contradiction to Cromwell's theory. Spohn, Thetford & Cancro (1970 (1970), Rappaport, Hopkins & Hall (1972) and Saccuzzo, Hirt & Spencer (1974) all found deficits in the paranoid group which were not evident in nonparanoids. In all instances, the nonparanoids performed at the same level as normals. Asarnow & Mann (1978) attempted to test Cromwell's stimulus redundancy theory by varying the size of background stimuli in a size estimation task. Although they replicated earlier findings of size overestimation amongst nonparanoid schizophrenics as compared to paranoid patients, they

did not find that paranoid schizophrenics were more affected by background stimuli than nonparanoids. This result was interpreted as indicating that paranoid schizophrenics were not responding to a broader range of input than nonparanoids, as would be predicted by Cromwell's theory. The authors argued that their findings questioned the adequacy of the stimulus redundancy interpretation of size estimation differences between paranoid and nonparanoid schizophrenics.

The findings related to Cromwell's theory have therefore been equivocal. Some support has been reported for the idea that paranoid patients were able to resist interference better than normals and that reactive schizophrenics were more able to discriminate peripheral signals than process patients. However, other studies have reported greater impairment amongst patients who would be identified as low redundancy schizophrenics in Cromwell's terms. The status of both Yates' and Cromwell's theories with regard to rates of processing were argued to be inconclusive.

Studies reviewed in this chapter indicate that relatively few studies have identified specific deficits amongst schizophrenics as compared to control groups. Many findings can be interpreted as indicating a generalized or nonspecific deficit and that the schizophrenics' lack of interest in experimental tasks was an explanation that could not yet be rejected. However, some consistency in the findings of studies of the span of apprehension were indicated. It was concluded however that no clear evidence has yet been produced in favour of either one of the three current theories, and that it was not yet clear that schizophrenics showed consistent deficits in either the initial, intermediate or response stages of processing.

S E C T I O N T H R E E

CHAPTER 10 - DESIGN OF THE INFORMATION PROCESSING STUDY

SECTION THREE

CHAPTER 10 - DESIGN OF THE INFORMATION PROCESSING STUDY

Several major reviews have highlighted a number of methodological problems common to investigations of schizophrenia. These difficulties will be discussed before the sample, procedure and tasks used in the present study are described.

10.1 SUBJECTS IN SCHIZOPHRENIA RESEARCH

Most of the difficulties in research arise in relation to the nature and state of the schizophrenic and control groups employed.

10.1.1 The Diagnosis of Schizophrenia

Despite the availability of suitable diagnostic schemes (for example, Feighner et al, 1972; Forrest & Hay, 1973; Carpenter, 1976) very few studies make explicit the criteria used for the diagnosis of schizophrenia (Herron, 1977). In a review covering four years, Cash (1973) found that 39% of the studies he examined reported using the diagnosis given in the patient's file as the basis for inclusion in the sample. The criteria used to arrive at such diagnoses are "hidden", in that they are unspecified, and therefore unavailable for comparison with the criteria used by other investigators.

10.1.2 The State of the Patient : Acute versus Chronic

Shakow (1969) justified the reliance on chronic patients in schizophrenia research by arguing that they were a "pure" sample (that is, they possessed the essential qualities of schizophrenia uncontaminated by extraneous factors) as against a "good" sample (that is, including subjects as they are distributed in nature). This reasoning can no longer be supported. Chronicity may not simply be a worsening of the acute state but may describe a qualitatively different condition (Mc Ghie, 1969). The

iatrogenic effects of institutionalization have been documented and the number of studies that have reported significant acute-chronic differences are sufficient evidence of the fact that these states are not simply variants of the same process. Despite this, chronic patients are overrepresented in schizophrenia research (Herron, 1977), mainly it seems, because of their accessibility. Only studies that have as their aim the clarification of the state of chronicity or of acute-chronic differences can justify exclusive reliance on chronic groups of patients. In accord with this view, a number of authors have advocated the study of acute patients in investigations of schizophrenia (Cromwell, 1972; Bromet, Harrow & Kasl, 1974). The fact that acute patients are often upset, excited and anxious (Rappaport, 1967; Rosenbaum, 1968) needs to be dealt with, for example, by the inclusion of an appropriate control group.

In addition to the bias towards chronic patients in research, there is the problem of "unselected groups of hospitalized schizophrenics" (Cromwell, 1972, p.124); that is, patients ranging from acute to chronic are grouped together in one, often small, sample. For example, in the Russell & Page (1976) study, reviewed earlier, their schizophrenic sample consisted of 16 paranoid patients with a previous hospitalization history ranging from 1 - 208 weeks and 16 nonparanoid patients with a history ranging from 2 - 61 weeks. Given the differences between acute and chronic patients, lack of differentiation of the sample along this dimension is likely to result in too heterogeneous a group of schizophrenics.

10.1.3 The Effects of Prior Treatments

Most studies exclude patients who have received electroconvulsive therapy 3 - 6 months prior to testing. However, there is no such simple solution to the effects of psychotropic medication. While it is not clear how phenothiazines achieve their effect, Goldstein maintains that there is no doubt that they significantly alter perception, attention and thought (Goldstein et al, 1969;

Goldstein, 1970). Some studies have reported a general trend of lowered performance by medicated schizophrenics (Lloyd & Newbrough, 1964; Mc Kinnon & Singer, 1969; Stone, Callaway, Jones & Gentry, 1969), while others have indicated that psychoactive drugs may enhance attention and information processing (Spring, Nuechterlein, Sugarman & Matthysse, 1977). On the basis of these findings, drug status would seem to be a significant subject variable regardless of the direction of its effects. However, reviews indicate that in approximately 60% of studies no mention is made of the drug status of the tested patients (Stieper, Ells, Farkas & Caplan, 1972; Cash, 1973).

One solution to the problem has involved withdrawing patients from medication prior to the study. However, this strategy has been criticized on the following grounds: firstly, the period of withdrawal is often too short; phenothiazines continue to be excreted for about a month after withdrawal (Venables, 1978); secondly, patients who are capable of functioning off medication, without becoming disruptive, are atypical of the schizophrenic group (Rochester, 1973; Spohn, 1973). Spohn (1973) has asserted that the only satisfactory solution entails testing newly-admitted patients who are, as yet, drug-free. Rochester (1973) believes that drug-free schizophrenics are not representative of schizophrenics in hospital and implies by this that no special strategy to control for the effects of medication need be adopted in research. Such an argument only makes sense if a new research goal is formulated; that of understanding and describing, not schizophrenics, but only medicated schizophrenics.

10.1.4 Sample Size

Holzman (1969) concluded that much of the research on schizophrenics was limited by small sample sizes, the typical size of subject groups being under 25. Small samples are certainly characteristic of the information processing studies reviewed in Chapter 9.

10.1.5 Subgroups of Schizophrenics

Despite the importance of strategies for reducing the heterogeneity of the schizophrenic group, Cash (1973) found that 66% of the studies he reviewed did not examine premorbid status, and 77% did not examine paranoid status as possible subject variables. A number of authors have advocated the use of both these dimensions in research and yet a significant number of recent studies (see Chapter 9) either do not employ such subgroupings at all, or only describe the sample along one dimension (more commonly as paranoid-nonparanoid). As Spohn, Thetford & Cancro put it, the importance of these subgroupings lies in the fact that they permit the identification of sources of variance in the data (1970).

Subgroupings in research are further complicated by the use of highly specific subgroups, for example, delusional versus non-delusional patients, as in Schneider's (1976) study, or by the use of less common subgroupings, such as "overinclusive", "middle-inclusive" and "underinclusive", as in the Knight, Sherer & Shapiro (1977) study. As it is not clear how such subgroups relate to the more common dimensions of chronicity, premorbidity and paranoia, studies employing these categories are difficult to compare with studies employing standard dimensions.

10.1.6 Selection versus Sampling of Subjects

Only one information processing study, that of Korboot & Damiani (1976), reported sampling by consecutive admissions. Aside from the usual exclusion criteria, such as a specified age range, absence of neurological impairment and a history which did not include alcoholism or drug abuse, all the other studies employed some unspecified method of sample selection. It is unspecified in the sense that it is not made explicit why, out of the larger available schizophrenic population, only a particular portion was included in the study.

A second type of selection occurs with the use of subgroups such as process-reactive. In many studies, patients at the two

extremes of this dimension are examined; this procedure might result in findings which do not represent the spectrum of schizophrenics. A notable exception to this approach was the study by Kilburg & Siegel (1973) in which they retained "borderline" process and reactive patients to ensure that they were sampling along a continuum.

Stieper et al (1972) concluded their review of reinforcement studies with the following indictment: "In the 90 experiments, the following groups of people were overrepresented in the samples of schizophrenic subjects: men, veterans, hospital patients, schizophrenics on drugs (of unknown types), co-operative patients, chronic patients, long-term hospitalized patients. The findings from any study cannot exceed the limits of the sample. Because of this lack of specificity in the sample drawing ... it has been necessary to coin a new term to refer to the schizophrenics in our samples of studies. This unique group of people within the American population will henceforth be referred to as 'schizophrenics in general' or SIG. It is conceivable that SIG does not refer to anything in the real world and may be the fanciful invention of researchers in schizophrenia research. The reader may judge for himself" (p.164).

10.1.7 Control Groups

Appropriate comparison groups are necessary in schizophrenia research for the following reasons: Firstly, to control for the effects of institutionalization. Prison inmates, long-term medically ill patients and nonschizophrenic psychiatric groups are suitable for this purpose. Secondly, psychiatric control groups are necessary to provide some check on the specificity of the findings to schizophrenia because there is ample evidence that severity of pathology and psychological deficit are positively correlated (Lang & Buss, 1965). Thirdly, normal controls are necessary to assess the specificity of the findings to psychiatric groups. Fourthly, the disturbed state of acute schizophrenics needs to be controlled for by the inclusion of acute nonschizophrenic psychiatric groups (Rosenbaum, 1968). Bannister (1971)

stated the reasoning thus: "Because schizophrenics are a subgroup of the class 'psychiatrically ill', any research designed to cast light on the nature of schizophrenia as a specific category must include nonschizophrenic psychiatric control groups as well as normals. Otherwise, any findings can be related to the super-ordinate distinction between persons who are and persons who are not under psychiatric care and thus, cannot carry implications for the subordinate class of 'schizophrenics'" (p.73).

In his review, Cash (1973) found that 33% of the studies scrutinized used no comparison groups except other schizophrenic types or repeated measures. Despite the fact that normal controls were used in only 37% of the studies, differences between the schizophrenic and normal groups were interpreted as a function of impairment specific to the diagnosis of schizophrenia. Only 11% of the studies employed both a nonschizophrenic patient control and a normal control group.

Furthermore, studies exploring process-reactive differences in schizophrenics do not normally control for the effects of competence by dimensionalizing the nonschizophrenic psychiatric control group. In the information processing studies reviewed in Chapter 9, not one study used this form of control. Hemsley (1976a) reported the process-reactive status of both his schizophrenic and control group, but this dimension was held constant in his study as both groups were classified as reactives.

A careful balance between control and selection needs to be found. As an illustration of the dangers of extreme subject selection, Ralph & Mc Carthy (1967) found that only 11% of the 455 diagnosed schizophrenics in the male wards from which they drew their sample, met all the conditions for acceptance in the study. These conditions were chronic, poor premorbid, aged between 25 and 50 years, I.Q. 80 - 124, ability to reach criterion on a simple discrimination task, lack of organic, neurological or alcoholic secondary diagnoses, and no E.C.T. within a year prior to the study. Ralph & Mc Carthy concluded that: "the small size and high

selectivity of the tested group raise serious questions concerning generalization of the findings not only to the total population of schizophrenics but even to the subgroup of 'chronic' schizophrenics" (p.964).

Taking these criticisms into account, the subjects included in this study were acute schizophrenics, selected on the basis of consecutive admission to three psychiatric units. Diagnosis, or allocation to the schizophrenic group, was made on the basis of an explicit diagnostic scheme. A proportion of these patients was not yet receiving any medication at the time of the study. Two control groups were used: an acute nonschizophrenic psychiatric group and a normal control group. The normal control group was specifically selected on the grounds of sharing the same social class as the majority of the patients. Both psychiatric groups were rated on a process-reactive measure, and this dimension was examined in both the schizophrenic and nonschizophrenic psychiatric group. In comparison to other studies, the samples were quite large, consisting of 3 groups of 40 subjects.

10.2 MEASURES IN SCHIZOPHRENIA RESEARCH

Keith et al (1976) made the following observation: "Not only must one contend with the usual confounding influence of hospitalization, type of patient studied, intelligence level, and verbal facility, but, in addition, one must recognize that different tests purporting to study the same variable (for example, memory) are often directed to very different aspects of a complex cognitive structure".

In this study, an attempt was made to select tasks that were as clearly related to the goals of the investigation as possible. The specific justification for each of the three tasks will be given in those sections in which the procedures are described.

10.3 THE PRESENT STUDY : A BRIEF OUTLINE

Three groups of subjects, acute schizophrenics, acute psychiatric controls and normals were tested on three information processing

tasks, two in the visual and one in the auditory modality. Each subject was required to complete both forms of the State-Trait Anxiety Inventory and the Ullmann-Giovannoni Self-Report Questionnaire. Details of the subjects, the tasks and the general procedure will be outlined below.

10.4 SUBJECTS

The subjects were 40 acute schizophrenics, 40 acute nonschizophrenic psychiatric patients and 40 normals. Characteristics of these subject groups have been discussed in detail in Chapters 5, 6 and 7. No attempt was made to match subjects, except insofar as a normal group, who shared the same socio-economic status as the majority of the patients, was selected. Nonetheless, there were no significant differences between the groups in terms of age, education and I.Q. (see Table 5). The two acute patient groups did not differ significantly from one another in terms of a number of indices of hospitalization experience (see Table 6); nor on the proportion of certain presenting signs of the disorder (see Table 7). The two psychiatric groups were also comparable in terms of the proportion of first to multiple admission patients. Both psychiatric groups were constituted by accepting into the sample all consecutive admissions to the source units and who were: male; aged 18 - 45 years; who had a negative history for neurological involvements, alcoholism or drug addiction; who had not received electro-convulsive treatment within 6 months of the study; and whose admission was one motivated by disturbance rather than administrative factors. Three patients who met the criteria for acceptance had to be rejected because they were not able to complete the practice trials on the information processing tasks. Two of these patients were subsequently diagnosed schizophrenic, and the other was diagnosed as depressed.

Diagnosis, or assignment to a psychiatric group, was based on a modified form of the Present State Examination (Carpenter, 1976). Any patient who was judged by the admitting psychiatrist to be showing 5 or more symptoms was assigned to the schizophrenic group,

a patient judged to be showing 4 or less, to the nonschizophrenic psychiatric control group. In all but 2 cases, the research diagnosis accorded with the final ward diagnosis of the patient. In the two discordant cases, both scoring ≤ 4 symptoms, but who were diagnosed as schizophrenic on the ward, assignment to a subject group was based on the research criterion in order to maintain consistency. The majority of the patients assigned to the psychiatric control group was diagnosed as depressed, personality disordered or neurotic.

The raw data for all the relevant subject characteristics are given in Appendix A, IV - VII. The sample is described fully in Chapters 5, 6 and 7.

10.4.1 Dimensions of the Patient Groups

No attempt was made to select patients along any subgroup dimensions. Once the patients in each group had been assessed, they were sub-divided along three relevant dimensions:

Process-reactive - As previously mentioned (see Chapter 5), the Ullmann-Giovannoni Self-Report Scale, with a cut-off point of 12, was used to assign the patients to either a process or a reactive group. This subdivision was used in both the schizophrenic and the psychiatric control group. The raw data is given in Appendix A, IV and V.

Paranoid-nonparanoid - As previously mentioned (see Chapter 5) assignment to one or the other group was based on an affirmative reply by the admitting psychiatrist to item 12 (widespread delusions) on the Interview Schedule. This subdivision was used with the schizophrenic group only.

Drug-nondrug - Consecutive admissions, as a method of sampling, was specifically employed in an attempt to assess patients prior to the onset of pharmacological treatment. This subdivision was employed with both the schizophrenic and the psychiatric control

group. As the patients in the study were recent admissions those who were medicated were receiving therapeutic dosages of phenothiazines, anti-depressants or minor tranquillizers.

The number of subjects in each subgroup are given in Table 27 below.

TABLE 27 - THE NUMBER OF PATIENTS IN EACH SUBGROUP

	Acute Schizophrenics	Acute Nonschizophrenic Psychiatric Controls	Normal Controls
Total	40	40	40
Process	23	16	-
Reactive	17	24	-
Paranoid	12	-	-
Nonparanoid	28	-	-
Drug	23	18	-
Nondrug	17	22	-

While this method of sample subdivision is statistically more complex, given the unequal numbers, it is preferable in that it obviates the difficulties caused by "hidden" selection of patients for subgroups.

10.5 MEASURES

Each measure used will be described separately in this section and the overall procedure of assessment will be described in 10.6.

10.5.1 Anxiety

As Rosenbaum (1968) had criticized studies for not controlling for the effects of anxiety in newly admitted patients, and as Silverman (1967) had remarked on the differences in anxiety levels among schizophrenics, two strategies were adopted in this regard: firstly, an acute psychiatric control group was incorporated, with the assumption that the anxiety associated with admission to

a hospital would be held constant, to some extent, in both groups of patients; secondly, all subjects, including the normal controls, were required to complete both the State and Trait forms of the "Self-Evaluation Questionnaire" (Spielberger et al, 1970). Previous research with patient populations (for example, Graham, 1969, in Spielberger et al, 1970) had indicated that the State scale was useful for evaluating the amount of anxiety experienced by patients when they were required to respond on certain tests. The Trait form of the scale was included as a check on the extent to which the individual perceived and/or represented himself as more anxious in the testing situation than usual. With such specific measures built into the design the effects of anxiety on task performance could therefore be assessed.

10.5.2 Information Processing Measures

Cromwell's theory makes two predictions about the information processing characteristics of schizophrenics: the one concerns the rate of processing, and the other concerns selectivity of attention (see Chapter 9). The theory does not incorporate any subsidiary predictions regarding modality differences. Both Mc Ghie, and Broen & Storms incorporated modality effects into their theories (see Chapter 8). There are few consistent findings with regard to modality differences, however. Schizophrenics are more prone to auditory than visual hallucinations (Bleuler, 1911; Callaway, 1970) and a number of writers have reported a greater auditory, relative to visual, impairment (Venables, 1964, 1975; Karras, 1973). On the other hand, greater visual impairments have also been reported (Mc Ghie, 1966; Reed, 1970). There is no evidence to suggest that schizophrenics suffer any impairments in acuity in these two modalities, but a number of studies have reported that schizophrenics can be abnormally distracted by irrelevant stimuli from a sensory modality that is not needed for performing a task (Kristofferson, 1967; Broen, 1968). These findings nonetheless suggest that information processing studies should tap performance in both the visual and the auditory modalities.

Three tasks, two in the visual modality and one in the auditory modality, were selected on the basis of their ability to reflect either the rate of information processing or the breadth of attention. The rationale, method and description of each of the three tasks is given in the following sections.

10.5.3 Mackworth's (1965) Procedure

Some views on the selectivity of attention were presented in Chapter 9; whether selection is active or occurs through information loss, is a moot point. "Because selectivity has broad meaning, it must be understood in different ways depending on the particular information involved, and the particular processes and tasks which provide the context" (Haber & Hershenson, 1973, p.204). According to Egeth (1967), the four chief tasks used in the study of selectivity are: briefly presented visual stimuli, multiple auditory messages, filtering in speeded classification tasks and visual search.

In schizophrenia research, aspects of the selectivity of attention have been investigated in a variety of ways: in the context of field articulation studies using tasks which require attention to certain segments of a stimulus field with simultaneous inhibition of attention to other segments of the field (for example, Schooler & Silverman, 1969); studies on the effects of distraction (for example, Stilson & Koppell, 1964); and studies of the span of apprehension in which matrix size, target-noise density and/or redundancy of noise have been manipulated (for example, Spohn, Thetford & Cancro, 1970; Alumbaugh & Sweney, 1973; Alumbaugh, 1976; Russell & Page, 1976).

It is not always clear how these tasks are related to the theoretical notions of overinclusive or broadened attention and underinclusive or narrowed attention, and the conclusions from studies such as those referred to above include comments on recognition thresholds, search processes, distraction effects and/or speed of processing. As Cegalis et al (1977) observe:

"Broadened and narrowed attention derive part of their meaning from an implicit visual-spatial metaphor. That is, broad or narrow attentional fields may correspond to changes in the spatial extensivity of peripheral vision" (p.47). It is in this respect that Cromwell's theory was examined in the present investigation. Cromwell postulated that high and low redundancy schizophrenics differed in terms of the extensiveness of their attention (see Chapter 9).

Mackworth (1965) measured the size of the field of attention by placing one, two or three targets in varying horizontal positions, either within foveal or peripheral vision. He found that normal subjects had no difficulty in identifying whether all three target letters were present, even when the two outside letters were as much as 10 degrees apart. When noise letters were added, however, accuracy of matching dropped dramatically. "Mackworth interpreted these results in terms of the size of the useful visual field - the area surrounding the fixation point from which information can be briefly stored and processed during a fixation. Too much information causes this field to constrict so as to prevent overloading the visual system. Adding visual noise or unwanted signals can narrow this useful field of view, creating what Mackworth calls tunnel vision - a priority given to targets in the fovea" (Haber & Hershenson, 1973, p.212). While Mackworth's procedure provides a direct means of measuring the size of attention, it has apparently not yet been employed in investigations of the presumed broadened and narrowed attention in subgroups of schizophrenics.

Task Description - Subjects were required to respond "yes" to the presence of three simultaneously presented target letters, under varying conditions of separation and noise. If only one or two targets were presented, with one or two nontarget letters, subjects were required to answer "no", indicating the absence of the complete set of three target letters.

Apparatus - The letters were presented on 25,5 x 10,0 cm white cardboard cards, with a display field of 7,6 x 12,7 cm. One of the two target letters, N or C, was presented on the fixation point, but the displays varied in terms of the number of additional nontarget letters presented and the width subtended by the outside target letters in the display. In the no noise condition, only 3 letters were displayed; line displays contained a horizontal line of 21 letters, with one of the designated targets in the middle; page displays showed 5 lines of letters, consisting altogether of 105 letters, again with one of the designated targets in the middle. The three target letters were either spaced close together, slightly spread or widely separated. The 6 recognition widths subtended 1, 2, 3, 4, 6 and 10 degrees. Only the 1- and 2-degree presentations were entirely foveal, the other widths required foveal and peripheral discrimination. The letters were printed with letraset (10pt UNIVERS 67, K69-10-CLN) and were 3 mm high and 5 mm between centres. The 18 displays (6 widths x 3 levels of noise) contained equal numbers of the two target letters, N or C; that is, 9 cards had C targets and 9 had N targets. A further 18 cards were prepared which had either 1 or 2 targets absent, but with the same variations of width and noise. These were randomly mixed with the complete-target cards. The displays were presented in a two-field Colne tachistoscope. The fixation point was marked with an X in the adaptation field and the display was exposed for 100 msecs. The luminance of both the stimulus and the adaptation fields was 5 ft. L.

Procedure - The subjects were told that the task assessed whether individuals could recognise differently placed letters which were presented for very short periods of time. They were urged to try to give an answer to every presentation. After explaining the task fully and acquainting the subject with the equipment, 10 practice trials were presented. An 80% accuracy level on the five 1- and 2-degree presentations, without noise, in the practice trials was accepted as a criterion of the subject's understanding and ability to perform the task. The same mixed order of the 36 displays was presented to each subject. Each display was

preceded by the preparatory instruction "Ready". The displays were presented at 10 - 15 second intervals, and the subject was instructed to give his response verbally without removing his face from the viewing visor.

10.5.4 Sperling's (1960) Partial Report Procedure

Yates' theory of cognitive deficit in schizophrenia incorporated the concept of rate of processing (see Chapter 10). Cromwell's theory makes specific predictions about rates of processing among subgroups of schizophrenics.

Dick (1974) sees little value in the concept of speed or rate of processing, arguing that besides being context-dependent, performance on processing tasks depends largely on the amount of space available in short term memory. Nevertheless one can infer from the theoretical accounts mentioned that the concept of rate of processing is normally applied to the very early stages of processing; that is, from iconic storage to short term memory store. It is assumed (see Knight, Sherer & Shapiro, 1977) that the speed of the information processing is equivalent to the rate of information transfer from iconic store to short term memory store. That is, performance on a task such as Sperling's (1960) partial report, reflects speed of processing. However, considering Dick's (1974) argument and his assertion that: "One of the chief limitations of performance (on such tasks) concerns the subject's ability to transfer material from iconic storage into a more permanent form" (p.580), it may be preferable to speak of relative efficiency or inefficiency than rate of processing. While "inefficient processing" (the term used by Neale, 1971) may be a less precise description, it does take into account Dick's argument regarding the space available in short term memory. The capacity of short term memory would depend on, amongst other things, the manner in which information was encoded. For example, "chunking" strategies would facilitate greater capacity (Dick, 1974). Therefore the term "inefficient processing" would be a more global description of a number of possible difficulties in processing from iconic storage to short term memory and culminating

in performance. Given the immature state of information processing studies of schizophrenia, it may be preferable to be less precise but to remain within the established domain of inference from task performance. In this study, therefore, Cromwell's predictions regarding rate of processing have been taken to refer, more globally, to efficiency of processing, so that schizophrenics who are presumed to be fast processors (that is, low redundancy) will be presumed to be efficient processors and vice versa for high redundancy schizophrenics.

Sperling's (1960) partial report procedure is suitable for making an assessment of the efficiency of transfer from iconic storage to short-term memory store. It has only been used in a small number of studies of information processing in schizophrenics. For example, Knight, Sherer & Shapiro (1977) produced results which were suggestive of differences in levels of efficiency of processing between under- and overinclusive schizophrenics. Knight et al only used 3 delay conditions, which made it more difficult to demonstrate decrements in performance corresponding to increasing delay intervals. According to Dick (1974), the asymptote of the delay curve occurs at a point between 250 and 1 000 msc after termination of the target stimulus and, estimates of a 250 msec duration for iconic store "is a lower estimate rather than the typical value" (p.577). This, in conjunction with Saccuzzo et al's (1974) finding, on a backward masking task, of improved performance in schizophrenics up to their maximum delay of 300 msec, suggests that longer delays should be incorporated into partial report tasks with schizophrenics.

Knight, Sherer & Shapiro (1977) used the method of a visual marker rather than the tone used by Sperling. While Dick (1974) argues that there are some differences between the two methods, he concludes that "considering the modality of the cue, the data available suggest that it is not important" (p.580). The rationale for their method, offered by Knight et al, was that schizophrenics have difficulties integrating information from different modalities. More specifically, [illegible]

schizophrenics, when compared with normals, take longer to process the auditory versus the visual cue. This has not yet been examined, but such a possibility could be part of a general description of inefficient processing.

Task Description - Subjects were required to report one row of figures out of a 3 x 3 matrix. Postcuing was provided in the form of a high, medium or low frequency tone which was presented at varying intervals following the offset of the target stimulus.

Apparatus - The figures were presented on 25,5 x 10,0 cm white cardboard, with a display field of 7,6 x 12,7 cm. The figures were stencilled with a black felt-tipped pen and were 1 cm high and 1,2 cm between centres. The matrices were prepared from a table of random numbers with the proviso that no figure could occur more than twice in a matrix and not more than once in a row. The matrices subtended visual angles of 3 degrees vertically and 5 degrees horizontally. The displays were presented for 100 msec in a two-field Colne tachistoscope. The fixation point was marked with an X in the adaptation field and the luminance of both the stimulus and the adaptation fields was 5 ft L. The postcuing stimuli were tones delivered at either low (164 cps), medium (758 cps) or high (1 011 cps) frequencies. The intervals between the stimulus display and the tone were controlled by a 7413 Schmitt Trigger TTL which allowed the tones to be delivered from 0,5 sec before, to 9,5 sec after, the tachistoscopic exposure, in steps of 10 msecs. The tone duration was approximately 0,5 sec. Twelve stimulus-tone intervals were used: the first tone was delivered 10 msec prior to the onset of the stimulus, the second was simultaneous with the stimulus and the other tones occurred at 10, 50, 100, 150, 200, 250, 300, 400, 500 and 1 000 msec delays after the offset of the stimulus matrix. Three sets of twelve cards, three cards for each delay condition, were administered to each subject. An equal number of high, medium and low tones occurred in the series, and over the series, each of the three tones was presented at each delay condition.

Procedure - The subjects were told that the task assessed whether people could remember figures after they had disappeared, even when they were presented at a very fast rate. It was suggested to subjects that they keep their eyes on the fixation point and attempt to be equally prepared for all tones. Further, that they should try to combat their bias to look at the top row first as the tones had been randomized and any one of the three had an equal probability of being used. Subjects were urged to try to give an answer to every presentation, even when they realised they had remembered the wrong row. After explaining the task fully and acquainting the subject with the equipment and the tones, 10 practice trials, with delays of 10 msec, were presented. A 60% accuracy level was accepted as a criterion of the subject's understanding and ability to perform the task. Each display was preceded by the preparatory instruction "Ready", and the displays were presented at 10 - 15 second intervals. The subject was instructed to give his response verbally without removing his face from the viewing visor.

10.5.5 Dichotic Presentation of Digits

Investigations of certain aspects of attention through the dichotic presentation of material has a long history in psychology. The method has also been used to study the attentional processes of schizophrenics, for example, Rappaport's work on simultaneous voice messages (Rappaport et al, 1966; among others).

Yates (1966b), referring to the work of Inglis (Inglis & Caird, 1963; among others), which had shown a short-term memory deficit with increasing age, argued that "the dichotic stimulation technique used by Inglis exactly parallels the two systems postulated as involved in the schizophrenic deficit, namely the primary processing system, and the short-term memory system" (p.108). Yates was drawing specifically on Broadbent's (1958) theory which suggested that when two messages arrived simultaneously, one of them was held temporarily in store while the

other was processed. As the short-term store, or S system was thought to be of short duration, parts of the stored message could be lost prior to processing. Yates (1966b) referred to earlier work using dichotic stimulation and asserted that they "did not use it in this way" (p.108), meaning Broadbent's split-span method (Moray, 1969) in which paired digits are presented dichotically and the response required is recall of the total span presented. The rationale for the technique was that defective recall of the first and second half set of digits would indicate malfunction of the "p" or processing system, whereas defective recall of the second half set only would indicate lack of storage (Venables, 1975). At that time, Yates concluded that: "As far as the author can discover, this particular technique has not been utilized with schizophrenics" (p.108). To some extent, Yates' conclusion still holds today.

Although dichotic techniques have gained some popularity in schizophrenia research many of the methods used have been selected on the basis of their suitability for investigating selective attention or inhibition of distraction rather than as assessments of speed of efficiency of the p system. To this end, various combinations of shadowing, with and without various forms of distraction, have been used (Payne, Hochberg & Hawks, 1970; Wishner & Wahl, 1974; Korboot & Damiani, 1976; Schneider, 1976; Straube & Germer, 1979). Hemsley & Zawada (1976) manipulated pre- and post-instructions for recall in an attempt to test schizophrenics' selective attention on the basis of Broadbent's (1971) model. There appears, however, to be some inconsistency in the application of Broadbent's (1958) model. For example, two of the studies mentioned previously concluded that "slow processing" could account for the results obtained (Wishner & Wahl, 1974; Korboot & Damiani, 1976). In contrast, Hawks & Robinson (1971) used a modified form of the split-span method to test the hypothesis of defective filtering in schizophrenics.

Broadbent (1958) initially proposed that the split-span experiment could be interpreted as a measure of attention switching time

between channels. According to Moray (1969) however, the bulk of the evidence is against such an interpretation, and while the method demonstrates limitations to processing, "much of the theoretical discussion of split-span tasks has centred on whether input or retrieval mechanisms are the cause of the limits" (p.51).

Lerner, Nachson & Carmon (1977) used a three- and four-digit split-span task to study strategies of attention in paranoid and nonparanoid schizophrenics. They found evidence of decreased accuracy of report with the second half-set of digits in both groups, a finding which they interpreted as evidence of slow processing. In terms of Broadbent's (1958) model discussed earlier, such a result is more consistent with inadequate storage than slow processing.

If one speaks more generally of inefficient (rather than slow) processing, then the split-span experiment is suited to testing Cromwell's theory. Processing, in this case, may be taken to refer to either input and retrieval or both, thereby avoiding the debate that has plagued interpretation of the method. In view of the modality differences found by other workers (see Chapter 9), the partial report procedure and the split-span method could be used to assess the generality of inefficient (or slow) processing in two different modalities. In addition, it may be one of the few tasks that could meet Hemsley's recommendation (1976b) for the use of information processing measures with schizophrenics; that is, the specification of cognitive abnormalities in terms of functions investigated in normal subjects. Much is known about "typical" performance on the task; for example, a preference for ear-by-ear report at fast rates of presentation but temporal report at slow rates, and a right-ear superiority in performance with verbal material, but a left-ear superiority with non-verbal material (Gray & Wedderburn, 1960; Bryden, 1963, 1964; Broadbent & Gregory, 1964; Inglis & Sykes, 1967; Geffen, 1978).

Task Description - Three pairs of digits were presented in such a way that the subject heard the two members of each pair as

simultaneously as possible. No response was required until all three pairs of digits had been presented; at the end of a 3-pair set, the subject was required to recall as many digits as he could in whatever order he wished (free recall).

Apparatus - Twenty four sets of digits were prepared, with each set consisting of 6 digits in 3 pairs. The digit sets were compiled from a table of random numbers, with the constraint that no digit be repeated in the same ear in one set. The digits were recorded on a Uher 4200 Report Stereophonic tape recorder, at a rate of one digit per second. One set of 3 digits was recorded on one channel, while the other set of 3 digits was synchronously recorded on the other channel. The subject therefore heard two digits per second, one in each ear. The interval between sets was 10 seconds. The stimuli were delivered via a pair of headphones (Stereo Phone Model SH - 650), each earphone connected to a different output channel.

Procedure - The subjects were told that the procedure assessed whether people could remember numbers when they were heard at the same time and in different ears. They were told to try to remember as many digits as they could and to report them verbally, in the order that was easiest for them, as soon as they had heard a full set. After explaining the task fully and acquainting the subject with the equipment, 10 practice trials were administered. A criterion of 60% accuracy of recall was accepted as evidence of the subject's understanding and ability to perform the task. Each subject was presented with the same order of digits. The order of recall and the number of digits recalled from the right and left ear were recorded.

10.6 GENERAL PROCEDURE

The staff at the three hospitals notified the investigator when a suitable patient was admitted (see Chapter 5.4 for sample selection criteria). All patients (both schizophrenic and psychiatric controls) were tested within 2 days of admission. Once the

patient's co-operation had been gained, he was requested to complete the State form of the anxiety scale. After completing the information processing tasks, the patient was requested to complete the Trait-form of the anxiety scale and the process-reactive self-report questionnaire. The procedure for testing the normal control group was essentially the same. The order in which any subject completed the information processing tasks was pre-determined in order to vary the order equally among the subjects in the three groups.

Suitable, consecutively admitted patients were assessed until there were 40 subjects in each of the two psychiatric groups. The admitting psychiatrist completed the symptom checklist which determined to which group the patient was assigned. The practice trials were used to assess the subject's understanding of, and capacity for, performing the task. On this basis, two schizophrenic and one psychiatric control subject were excluded. No suitable patient refused to co-operate with the study. All subjects had normal or corrected vision and normal hearing.

Much has been made of the co-operativeness of schizophrenic subjects; for example, Shakow (1963) rated his subjects on a scale of co-operation, which when taken into account, often eliminated schizophrenic-normal differences. Many observers have asserted that schizophrenics lack the motivation to perform well on the tasks used in research. Holzman (1969) argued that the choice of co-operative patients in research limited the representativeness of the sample. While the latter criticism could not be applied to the present investigation, the "subtle pressure of asking for co-operation of an individual committed to a mental hospital is recognised" (Rappaport et al, 1966, p.24).

S E C T I O N T H R E E

CHAPTER 11 - RESULTS OF THE INFORMATION PROCESSING STUDY

SECTION THREE

CHAPTER 11 - RESULTS OF THE INFORMATION PROCESSING STUDY

The subjects have been fully described in previous chapters. Characteristics of the acute schizophrenic, acute nonschizophrenic psychiatric control and the normal control group are given in Appendices A, IV, V, VI. Summary tables for the analyses of variance are given in Appendix A, IX.

In this chapter, the results for each of the three information processing tasks will be presented separately. Initially, however, the results from the state and trait anxiety questionnaires will be cited.

11.1 THE STATE-TRAIT ANXIETY INVENTORY

The means and standard deviations of the state and trait anxiety scores for the three groups of subjects are given in Table 28 below.

TABLE 28 - MEAN STATE AND TRAIT ANXIETY SCORES OF ACUTE SCHIZOPHRENICS, ACUTE PSYCHIATRIC PATIENTS AND NORMAL CONTROLS

		State	Trait
Acute Schizophrenics	$\bar{x}$	44,75	45,75
	S.D.	12,61	9,87
Acute Psychiatric Controls	$\bar{x}$	52,03	48,05
	S.D.	12,61	10,33
Normal Controls	$\bar{x}$	35,48	35,50
	S.D.	8,93	7,20

A two-way analysis of variance, with a repeated measure on anxiety,

demonstrated that the difference in anxiety levels between the three groups was significant ($F = 26,52$; $df = 2,117$; $p<0,01$). There were no significant differences between the state and trait anxiety scores in either of the three groups. However, differences in performance on information processing may be related to these differences in anxiety level. The mean state anxiety score of the normal group was lower than that of the two patient groups. In order to assess the significance of these differences for the study, the state anxiety scores were correlated with overall level of performance on each of the experimental tasks. These results are presented at a later point in the chapter.

11.2 MACKWORTH'S (1965) PROCEDURE

The responses were scored as either right or wrong. Overall level of performance referred to the total number of correct responses. Errors were scored as "misses" or "false alarms"; any trial on which a subject did not report seeing the three target letters when, in fact, they were presented, was scored as a miss (error of omission). Trials on which subjects erroneously reported the target were scored as false alarms (error of commission).

For the analysis of the data, the 6 recognition widths were combined into 3 groups: 1 and 2 degrees, 3 and 4 degrees, 6 and 10 degrees. The 1 and 2 degree angles were both within foveal vision and there was probably little functional difference between 3 and 4 degrees, and 6 and 10 degrees.

The mean recognition scores of the three subject groups are given in Table 29 overleaf.

TABLE 29 - MEAN RECOGNITION SCORES OF SCHIZOPHRENICS, PSYCHIATRIC CONTROLS AND NORMALS

	1^{o} & 2^{o}			3^{o} & 4^{o}			6^{o} & 10^{o}		
	N	L	P	N	L	P	N	L	P
Schizophrenics (n = 40)	3,58	2,03	1,93	3,48	2,00	2,25	3,10	2,45	1,58
Psychiatric Controls (n = 40)	3,74	2,05	2,08	3,40	1,75	1,73	3,35	2,18	1,48
Normal Controls (n = 40)	3,78	2,25	1,85	3,83	2,08	2,05	3,25	2,28	1,83

N = No noise
L = Line of noise letters
P = Page of noise letters

A three-way analysis of variance, with repeated measures on recognition width and level of noise, was computed. The main effects of angle ($F = 5,62$; $df = 2,234$; $p<0,01$) and level of noise were significant ($F = 291,55$; $df = 2,234$; $p<0,001$); the interaction between these two factors was significant ($F = 10,96$; $df = 4,468$; $p<0,001$). However, no significant differences between the groups were found. As between-group differences were of primary interest in this study, the significant interaction between increasing angle and increasing noise level was not subjected to further scrutiny.

The above analysis indicated that the schizophrenic group, as a whole, did not perform at a significantly different level from the psychiatric and normal control groups. However, the question remained whether any subgroups of schizophrenics or psychiatric patients would differ significantly from one another. The three subgroups of particular interest were the process-reactive, paranoid-nonparanoid and drug-nondrug groups. The analyses of these

subgroup differences were not conducted within the 3-factor model because of the difficulties associated with unequal cell entries, resulting from subdividing the patient groups, and repeated measures on two factors. However, it seemed that t-tests would provide an adequate test of the significance of any differences between the means of subgroups of patients*. Each of the three subgroup differences will be dealt with separately in the following sections.

11.2.1 Process and Reactive Subgroups

The mean recognition scores of process and reactive schizophrenics are given in Table 30 below, together with the computed t for each comparison.

TABLE 30 - MEAN RECOGNITION SCORES OF PROCESS AND REACTIVE SCHIZOPHRENICS

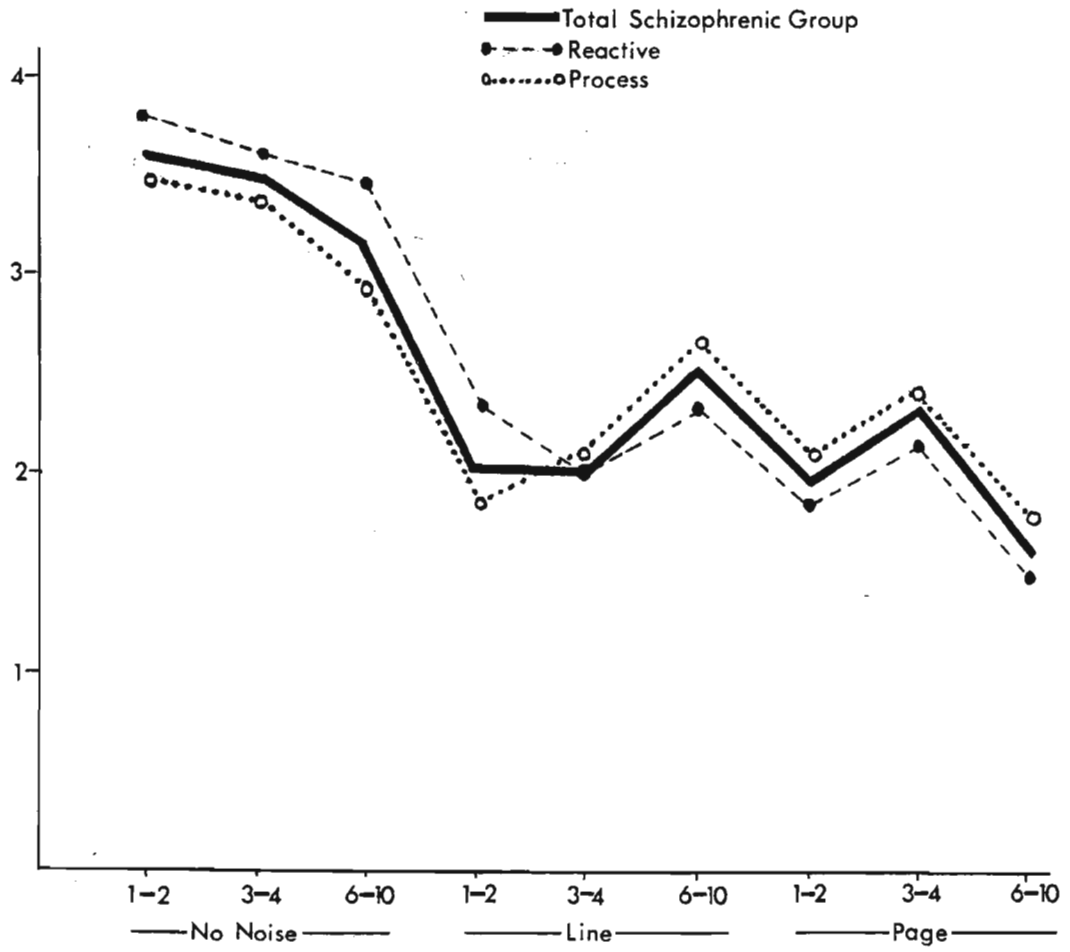
	1^{o} & 2^{o}			3^{o} & 4^{o}			6^{o} & 10^{o}		
	N	L	P	N	L	P	N	L	P
Reactive Schizophrenics (n = 17)	3,76	2,23	1,76	3,58	1,94	2,17	3,35	2,29	1,47
Process Schizophrenics (n = 23)	3,43	1,87	2,04	3,39	2,04	2,30	2,91	2,57	1,65
t (df = 38)	1,67	1,16	0,90	0,86	0,40	0,39	1,52	0,94	0,62

There were no significant differences between the means of process and reactive schizophrenics on any level of the two factors. The performance of the two groups at increasing noise levels, as

* Troskie, L. Professor of Mathematical Statistics, University of Natal, Durban.

compared to the combined schizophrenic group, is depicted graphically in Figure 4 below.

Figure 4 - The Performance of Process and Reactive Schizophrenics at Increasing Levels of Noise



Because of the cross-over in performance, with reactive schizophrenics scoring higher than process schizophrenics at low levels of noise, but lower at high levels, further enquiry seemed necessary. A two-way analysis of variance (groups x noise level), with a repeated measure on noise, was computed by the method of unweighted means for unequal cell entries. No significant differences between process and reactive schizophrenics were found ($F =< 1$; $df = 1,38$) and the interaction was not found to be significant ($F =< 1$; $df = 2,76$).

The psychiatric control group was also divided into process and reactive categories and their mean recognition scores are given in Table 31 below, together with the computed t for each comparison.

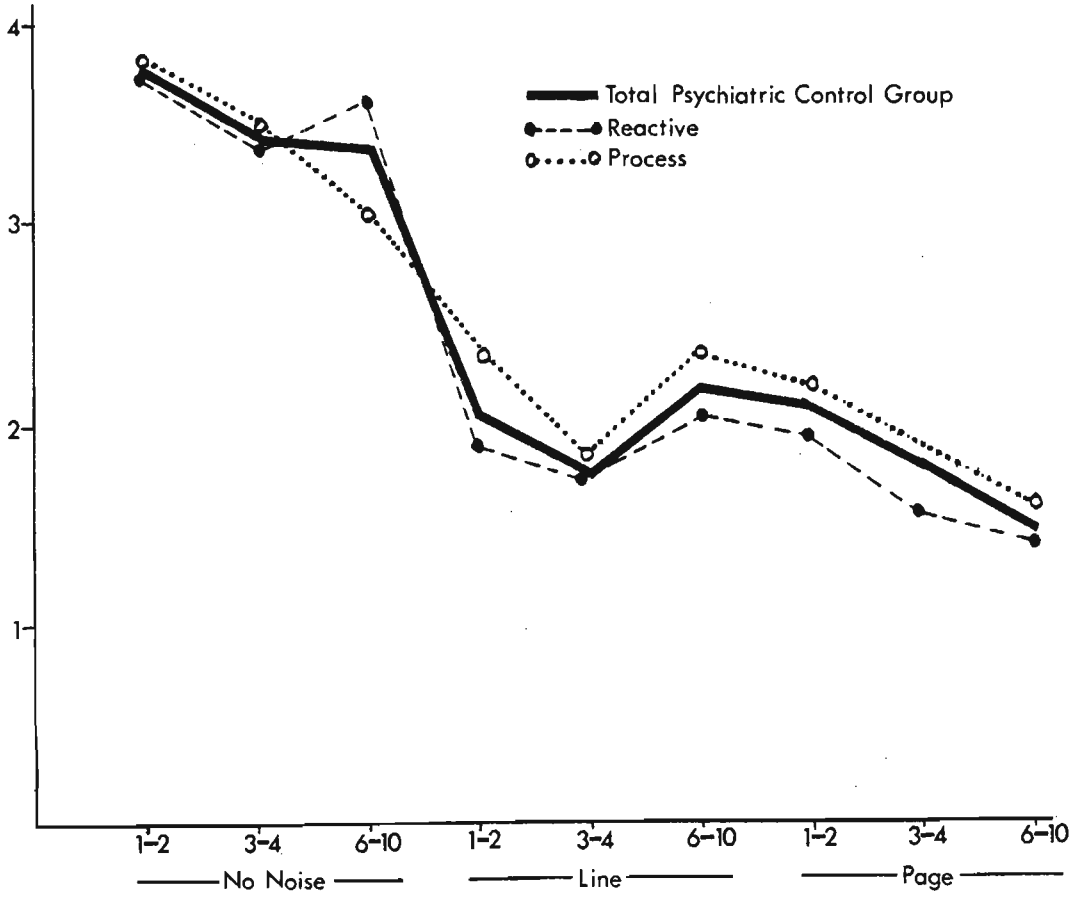
TABLE 31 - MEAN RECOGNITION SCORES OF PROCESS AND REACTIVE PSYCHIATRIC CONTROL PATIENTS

	1^{o} & 2^{o}			3^{o} & 4^{o}			6^{o} & 10^{o}		
	N	L	P	N	L	P	N	L	P
Reactive Psychiatrics (n = 24)	3,75	1,91	1,95	3,37	1,75	1,54	3,62	2,00	1,45
Process Psychiatrics (n = 16)	3,75	2,25	2,25	3,43	1,75	2,00	2,93	2,43	1,50
t (df = 38)	-	1,17	1,03	0,21	-	1,64	3,47**	1,23	0,15

** $p < 0,01$

There was only one significant difference between process and reactive patients, at the 6 and 10 degree level, without noise. The performance of the two groups at increasing noise levels, as compared to the combined psychiatric control group, is depicted graphically in Figure 5 overleaf.

Figure 5 - The Performance of Process and Reactive Psychiatric Patients at Increasing Levels of Noise



With reference to Figures 4 and 5, there appeared to be a marked correspondence between the performance of process and reactive psychiatric patients, and process and reactive schizophrenics; in both patient groups the process patients did better than the reactive patients at increased levels of noise. This made it appear as if the process-reactive dimension might be related to performance on this task, irrespective of psychiatric diagnosis. For this reason, a further two-way analysis of variance, with a repeated measure on noise level, was computed. In this analysis, however, the psychiatric control and schizophrenic subjects were combined to form joint process and reactive groups. However, neither the main effect of groups ($F = < 1$; $df = 1,78$) nor the interaction ($F = 1,86$; $df = 2,156$) was found to be significant.

In conclusion, process and reactive patients, whether schizophrenic or not, were not found to perform differently on

Mackworth's procedure for assessing the size of the functional visual field.

11.2.2 Paranoid and Nonparanoid Schizophrenics

The mean recognition scores of the schizophrenic group, divided into paranoid and nonparanoid patients, are given in Table 32 below.

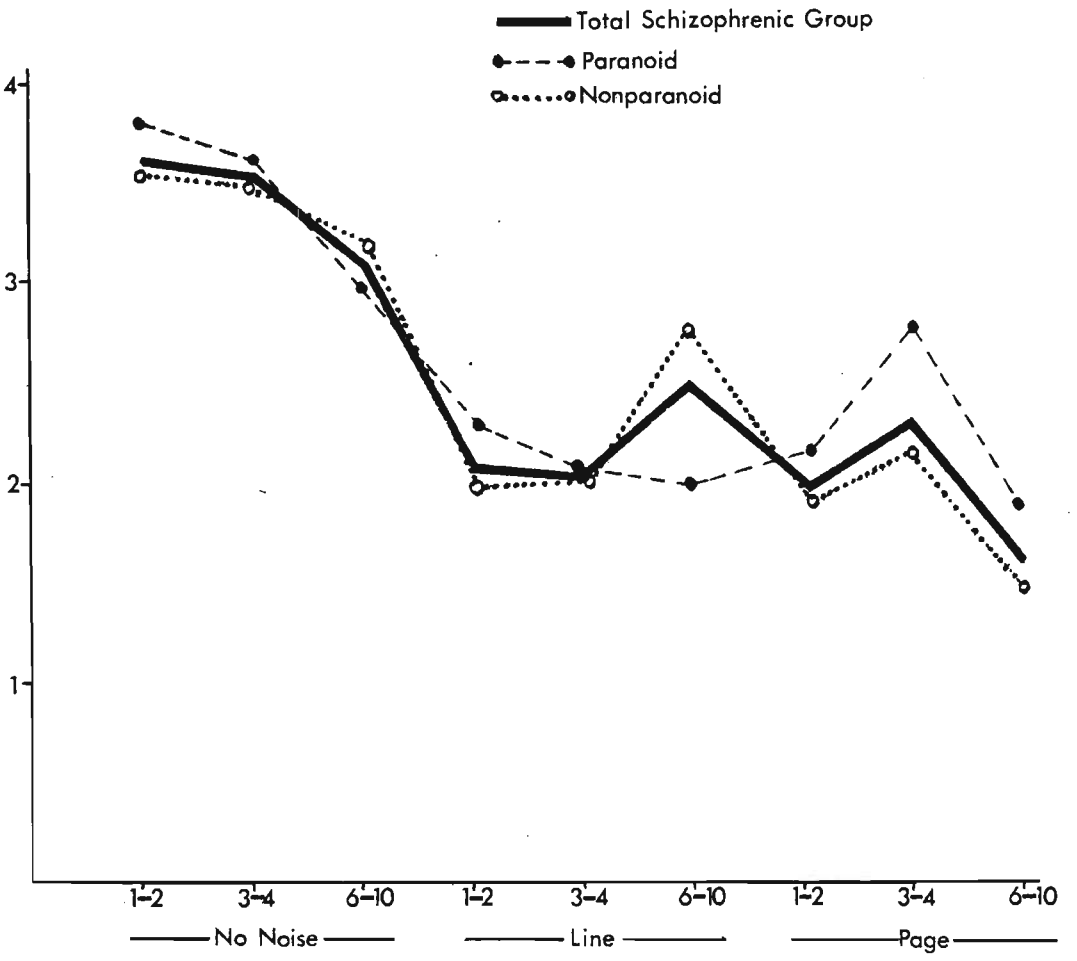
TABLE 32 - MEAN RECOGNITION SCORES OF PARANOID AND NONPARANOID SCHIZOPHRENICS

	1^{o} & 2^{o}			3^{o} & 4^{o}			6^{o} & 10^{o}		
	N	L	P	N	L	P	N	L	P
Paranoid Schizophrenics (n = 12)	3,75	2,25	2,16	3,58	2,00	2,75	2,83	1,92	1,83
Nonparanoid Schizophrenics (n = 28)	3,50	1,93	1,82	3,43	2,00	2,04	3,21	2,68	1,46
t (df = 38)	1,14	0,94	1,00	0,63	-	3,94**	3,73**	2,51*	1,19

** $p < 0,01$
* $p < 0,05$

The same data is presented graphically in Figure 6 overleaf.

Figure 6 - The Performance of Paranoid and Nonparanoid Schizophrenics at Increasing Levels of Noise



It is difficult to discern the meaning of the three significant differences found between paranoid and nonparanoid schizophrenics (Table 32). There was no clear trend in the differences; the paranoid schizophrenics performed better than the nonparanoids at the 6 and 10 degree presentation, whereas the reverse was true for the 3 and 4 degree difference. Unlike the pattern in the process-reactive comparisons, where the differences seemed to emerge with increasing levels of noise, the differences between paranoid and nonparanoid schizophrenics seemed to occur with increasing

width of target presentation.

Cromwell (1968) proposed that reactive-paranoid and process-nonparanoid schizophrenics may comprise two extreme groups in terms of cognitive functioning. In this study, process schizophrenics tended to do better than reactives at higher levels of noise, and the present differences could be seen to suggest that nonparanoid schizophrenics may do better than paranoids at increasing angle of presentation (see Table 32, where two of the three significant differences show superior performance by non-paranoid schizophrenics). To assess whether any between-group differences could be obtained by subdividing the schizophrenic group into reactive-paranoids and process-nonparanoids, the data was reanalysed by two two-way analyses, first with increasing levels of noise and then with increasing angle of presentation. The mean recognition scores of these two groups at increasing levels of noise are given in Table 33 below.

TABLE 33 - MEAN RECOGNITION SCORES OF REACTIVE-PARANOID AND PROCESS-NONPARANOID SCHIZOPHRENICS AT INCREASING LEVELS OF NOISE

	No Noise	Line	Page
Reactive-Paranoid (n = 8)	8,00	6,00	6,75
Process-Nonparanoid (n = 19)	10,00	6,47	5,89

With increasing levels of noise, no significant between-group differences were found ($F =< 1$; $df = 1,25$) and the interaction between groups and noise level was not found to be significant ($F = 1,79$; $df = 2,50$).

The mean recognition scores of the two groups at increasing visual angle of target presentation are given in Table 34 overleaf.

TABLE 34 - MEAN RECOGNITION SCORES OF REACTIVE-PARANOID AND PROCESS-NONPARANOID SCHIZOPHRENICS WITH INCREASED WIDTH OF TARGET SEPARATION

	1^{o} & 2^{o}	3^{o} & 4^{o}	6^{o} & 10^{o}
Reactive-Paranoid Schizophrenics (n = 8)	8,63	8,75	6,50
Process-Nonparanoid Schizophrenics (n = 19)	7,37	7,79	7,11

Although the main effect of groups was not significant ($F < 1$; $df = 1,25$), there was a significant interaction between groups and angle ($F = 3,59$; $df = 2,50$; $p < 0,05$). Individual comparisons showed that reactive-paranoid schizophrenics did significantly better at the 1 and 2 degree and 3 and 4 degree levels, than at the 6 and 10 degree level ($F = 3,23$ and $3,61$, respectively; $df = 2,50$; $p < 0,05$). No other comparisons were significant. This finding is in the opposite direction to Cromwell's hypothesis regarding widened attention in low redundancy schizophrenics.

11.2.3 Drug Effects

To assess the effects of medication on performance, a comparison was made between the overall scores of medicated and nonmedicated patients in both the schizophrenic and the psychiatric control groups. The mean total scores of these four groups are given in Table 35 overleaf.

TABLE 35 - MEAN TOTAL SCORES OF DRUG AND NONDRUG PATIENTS IN THE SCHIZOPHRENIC AND PSYCHIATRIC CONTROL GROUPS

	Drug (n = 23)	Nondrug (n = 17)
Schizophrenics	21,78	21,94
	Drug (n = 18)	Nondrug (n = 22)
Psychiatric Controls	21,06	22,32

A two-way analysis of variance showed no significant differences between the overall scores of medicated and nonmedicated patients, whether schizophrenics or psychiatric controls.

11.2.4 Errors

There has been considerable interest in the type of errors made by schizophrenic patients on tests of attention, and conclusions about functioning have been based on differential error scores for normals and schizophrenics (see Chapter 9). Pigache (1976) has argued that signal detection analyses do not apply "in suprathreshold tasks where psychological deficit exists" (p.245), and he has proposed an error index which combines errors of omission and commission, while retaining the ability to consider them apart. However, these two types of errors have been considered separately in this study. The means of the errors of commission and omission of the three subject groups are presented in Table 36 overleaf.

TABLE 36 - MEAN ERRORS OF OMISSION AND COMMISSION OF SCHIZOPHRENICS, PSYCHIATRIC CONTROLS AND NORMALS

	Normals	Psychiatric Controls	Schizophrenics
Omission	7,9	7,95	8,48
Commission	4,3	5,55	4,26

All three groups made nearly twice the number of omission as compared to commission errors. No statistical analysis was performed on this data because the lack of significant differences between the three groups on accuracy of recall and the similarity of the ratios of commission to omission errors in all three groups made the possibility of significant differences extremely unlikely. Therefore schizophrenics did not appear to make more, or different types of, errors as compared to the two control groups.

Summary

On a procedure designed to assess the size of the functional visual field, schizophrenics did not perform differently from psychiatric controls and normals. Process and reactive patients could not be distinguished on the basis of the task. The paranoid and non-paranoid schizophrenics' performance differed significantly on 3 of the 9 levels of the task, but no clear trend emerged from these findings. Reactive-paranoid and process-nonparanoid schizophrenics did not differ in performance, but reactive-paranoids were found to perform at a significantly lower level when targets were presented on the periphery as opposed to when targets were within foveal vision. This finding would appear to contradict Cromwell's hypothesis regarding widened attentional fields in low redundancy schizophrenics.

11.3 PARTIAL REPORT PROCEDURE

Responses were scored as right or wrong; the subject was required

to report the correct digit in the correct position in a row. As in Sperling's (1960) experiment, the number of digits available to the subject was estimated by multiplying the number of digits correctly reported in a row by the number of equiprobable partial reports presented; in this case, 3. The overall score referred to the total number of digits correctly reported in the whole series. The percentage of digits correctly reported in response to each of the three tones was also calculated. Errors were scored as either errors of omission or errors of commission. In addition, the number of whole rows incorrectly reported was also recorded; for example, a subject reporting the top row correctly in response to the middle tone.

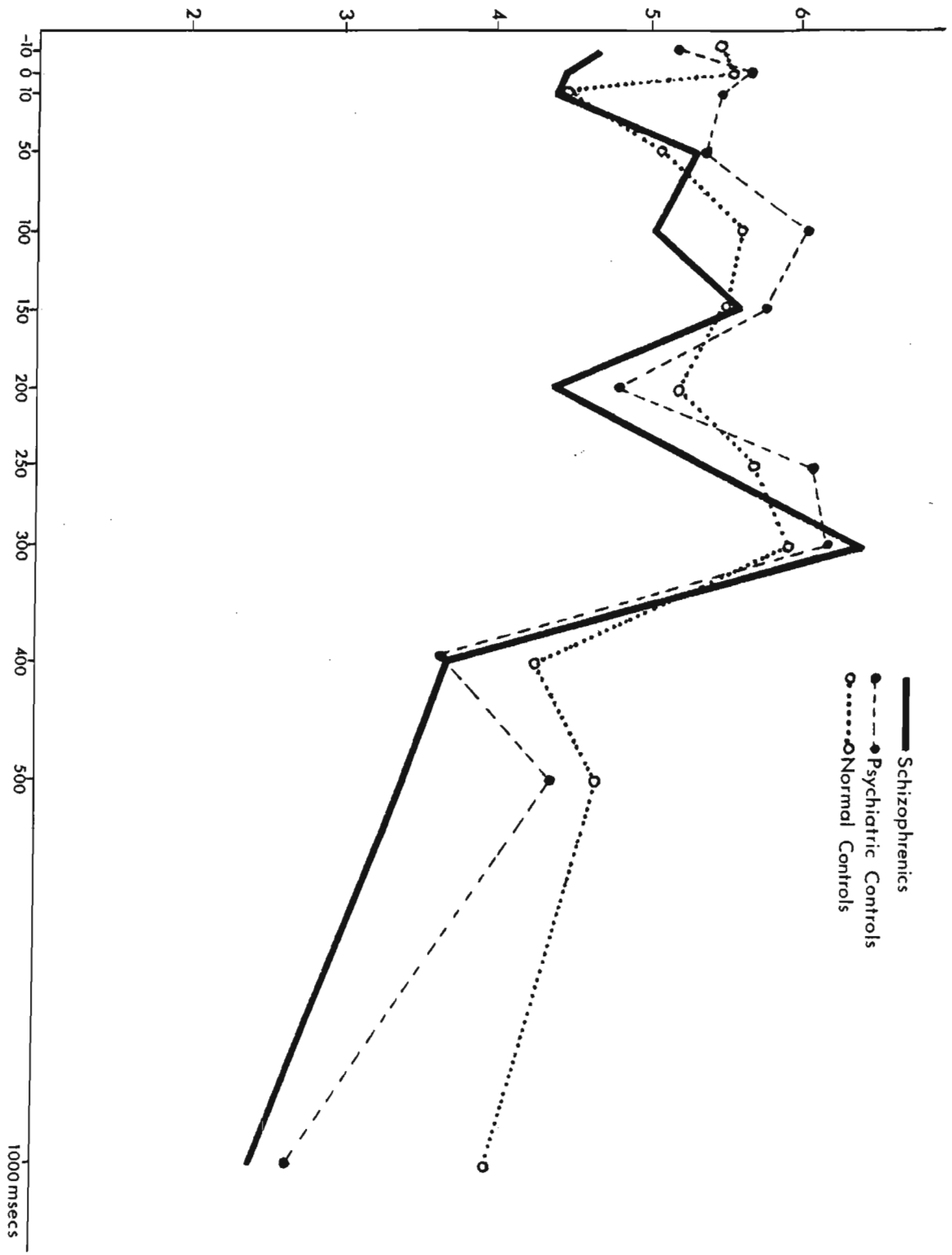
The means of the number of digits available to the schizophrenic, psychiatric control and normal groups at each delay condition is given in Table 37 below.

TABLE 37 - MEAN DIGITS AVAILABLE TO SCHIZOPHRENICS, PSYCHIATRIC CONTROL PATIENTS AND NORMALS AT INCREASING DELAY INTERVALS

	-10	0	+10	50	100	150	200	250	300	400	500	1000
Schizophrenics	4,63	4,48	4,33	5,28	5,03	5,60	4,30	5,33	6,35	3,68	3,40	2,40
Psychiatric Controls	5,18	5,65	5,23	5,28	6,08	5,75	4,78	6,05	6,18	3,65	4,33	2,63
Normals	5,23	5,55	4,40	5,03	5,60	5,50	5,20	5,68	5,88	4,25	4,68	3,98

The same data are presented graphically in Figure 7 overleaf.

Figure 7 - Mean Number of Digits Available to Schizophrenics, Psychiatric Controls and Normals at Increasing Delay Intervals



A two-way analysis of variance, with repeated measures on delays, revealed no significant difference in the performance of the three groups ($F = 1,35$; $df = 2,117$), and no significant interaction between groups and delays ($F = 1,74$; $df = 22,1287$). The effect of delays was, of course, significant ($F = 26,32$; $df = 11,1287$; $p < 0,001$). Therefore, schizophrenics were found to perform no differently from the two control groups on Sperling's (1960) partial report procedure. From Figure 7 it can be seen that schizophrenics had fewer digits available at longer delay intervals than normals, even though these differences were not significant.

11.3.1 Process and Reactive Subgroups

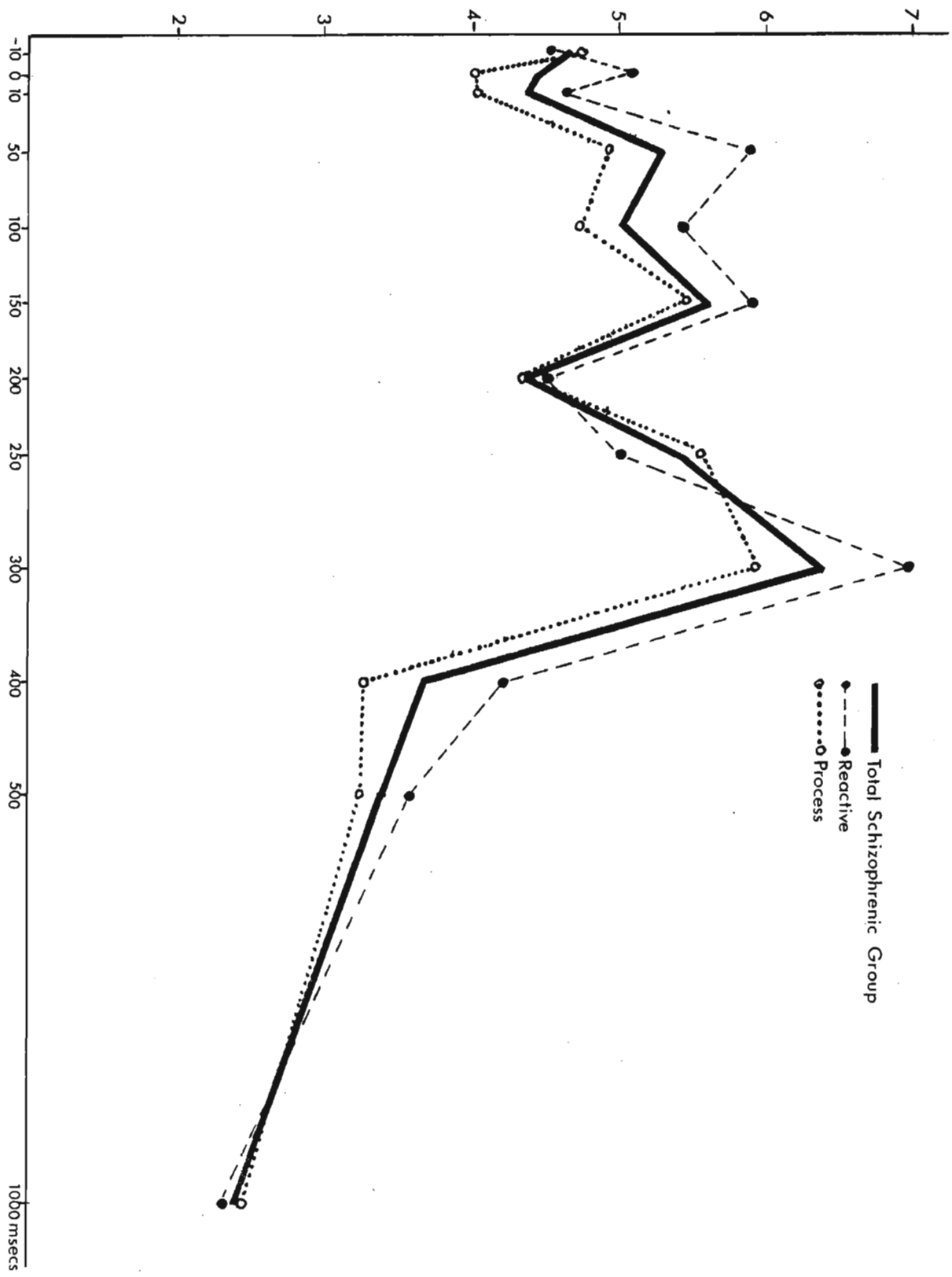
The means of the number of digits available at each delay condition to process and reactive schizophrenics are given in Table 38 below.

TABLE 38 - MEAN DIGITS AVAILABLE TO PROCESS AND REACTIVE SCHIZOPHRENICS AT INCREASING DELAY INTERVALS

	-10	0	+10	50	100	150	200	250	300	400	500	1000
Process Schizophrenics (n = 23)	4,70	4,00	4,09	4,87	4,74	5,43	4,35	5,57	5,87	3,26	3,26	2,48
Reactive Schizophrenics (n = 17)	4,53	5,12	4,65	5,82	5,41	5,82	4,41	5,00	7,00	4,24	3,59	2,29

The same data are presented graphically in Figure 8 overleaf.

Figure 8 - Mean Number of Digits Available to Process and Reactive Schizophrenics at Increasing Delay Intervals



Although the effect of delays was once again found to be significant ($F = 8,81$; $df = 11,418$; $p < 0,001$), neither the main effect of groups ($F =< 1$; $df = 1,38$) nor the interaction were found to be significant ($F =< 1$; $df = 11,418$). No differences between the performance of process and reactive schizophrenics were therefore evident on partial report.

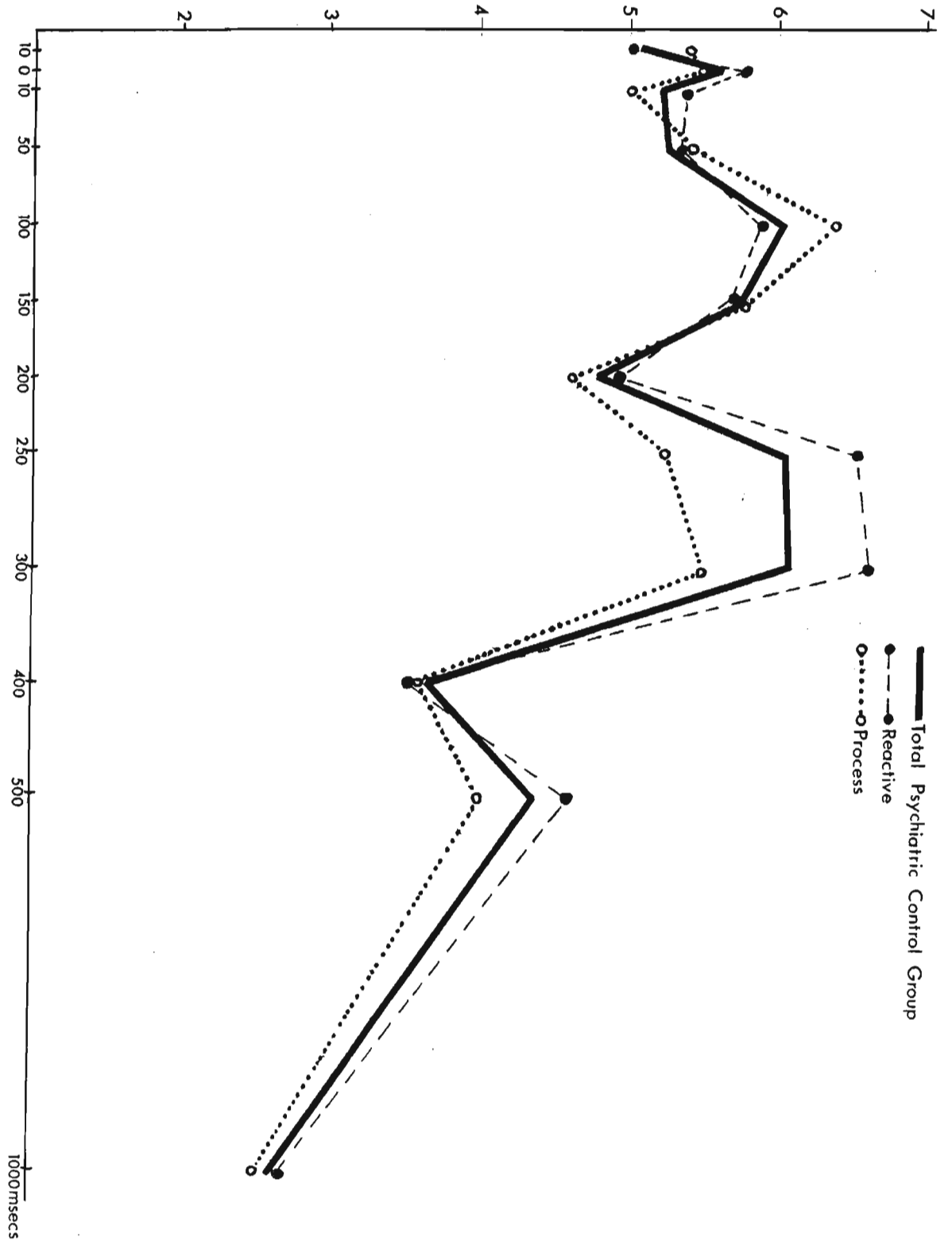
The mean number of digits available to process and reactive psychiatric control patients is given in Table 39 below.

TABLE 39 - MEAN DIGITS AVAILABLE TO PROCESS AND REACTIVE PSYCHIATRIC CONTROL PATIENTS AT INCREASING DELAY INTERVALS

	-10	0	+10	50	100	150	200	250	300	400	500	1000
Process Patients (n = 16)	5,38	5,44	5,00	5,31	6,38	5,75	4,69	5,25	5,50	3,69	4,00	2,56
Reactive Patients (n = 24)	5,04	5,79	5,38	5,29	5,88	5,75	4,83	6,58	6,63	3,63	4,63	2,67

The same data are presented graphically in Figure 9 overleaf.

Figure 9 - Mean Number of Digits Available to Process and Reactive Psychiatric Controls at Increasing Delay Intervals



The effects of delay on performance was again found to be significant ($F = 9,97$; $df = 11,440$; $p < 0,001$). However, neither the main effect of groups ($F = < 1$; $df = 1,38$) nor the interaction between groups and delays ($F = < 1$; $df = 11,418$) was significant. Therefore no differences were found between process and reactive psychiatric control patients.

The two patient groups were combined to form a separate process and reactive group in order to assess the effects of process-reactive designation, irrespective of psychiatric diagnosis. The mean scores of this combined group are given in Table 40 below.

TABLE 40 - MEAN DIGITS AVAILABLE TO PROCESS AND REACTIVE PATIENTS (COMBINED GROUPS) AT INCREASING DELAY INTERVALS

	-10	0	+10	50	100	150	200	250	300	400	500	1000
Process Patients (n = 39)	4,97	4,59	4,46	5,05	5,41	5,56	4,49	5,44	5,72	3,44	3,56	2,51
Reactive Patients (n = 41)	4,83	5,51	5,07	5,51	5,68	5,78	4,66	5,93	6,78	3,88	4,19	2,51

Althoug the effect of delays was once again found to be significant ($F = 18,77$; $df = 11,880$; $p < 0,001$), neither the main effect of groups ($F = < 1$; $df = 1,78$) nor the interaction between groups and delays was significant ($F = < 1$; $df = 11,858$).

Therefore no differences were found between the performances of process and reactive patients, whether this division was made between schizophrenics, psychiatric control patients or a combined psychiatric group.

11.3.2 Paranoid and Nonparanoid Schizophrenics

The mean number of digits available to paranoid and nonparanoid

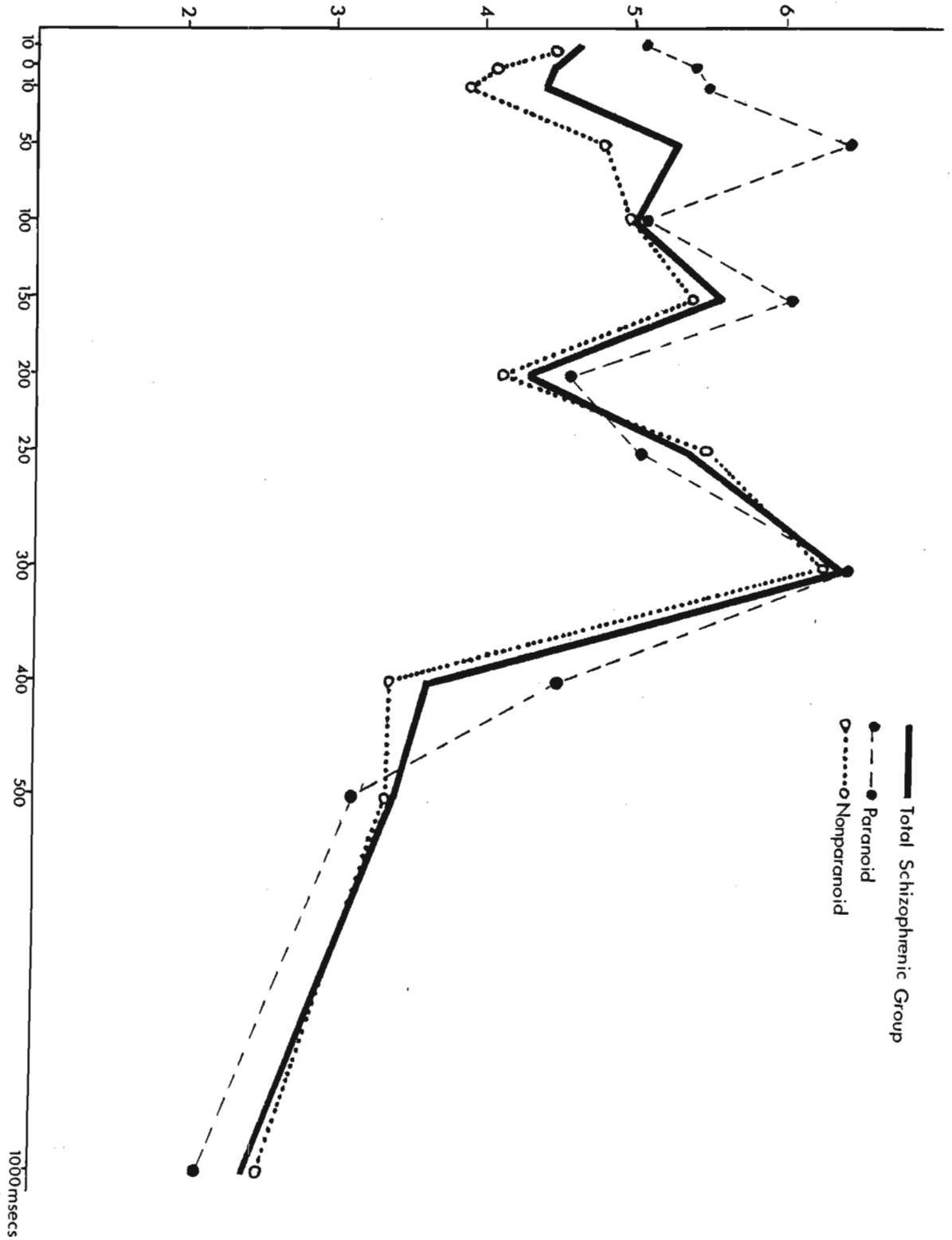
schizophrenics at each delay condition is given in Table 41 below.

TABLE 41 - MEAN DIGITS AVAILABLE TO PARANOID AND NONPARANOID SCHIZOPHRENICS AT INCREASING DELAY INTERVALS

	-10	0	+10	50	100	150	200	250	300	400	500	1000
Paranoid Schizophrenics (n = 12)	5,08	5,33	5,42	6,42	5,08	6,08	4,58	5,08	6,42	4,50	3,17	2,17
Non-paranoid Schizophrenics (n = 28)	4,43	4,11	3,86	4,79	5,00	5,39	4,18	5,43	6,32	3,32	3,39	2,50

The same data are presented graphically in Figure 10 overleaf.

Figure 10 - Mean Number of Digits Available to Paranoid and Nonparanoid Schizophrenics at Increasing Delay Intervals



A two-way analysis of variance revealed no significant between-group difference ($F = < 1$; df = 1,38) and no significant interaction between groups and delays ($F = < 1$; df = 11,418). The main effect of delays was once again found to be significant ($F = 8,05$; df = 11,418; $p < 0,001$). Therefore no significant differences were found between the performance of paranoid and nonparanoid schizophrenics on a partial report procedure.

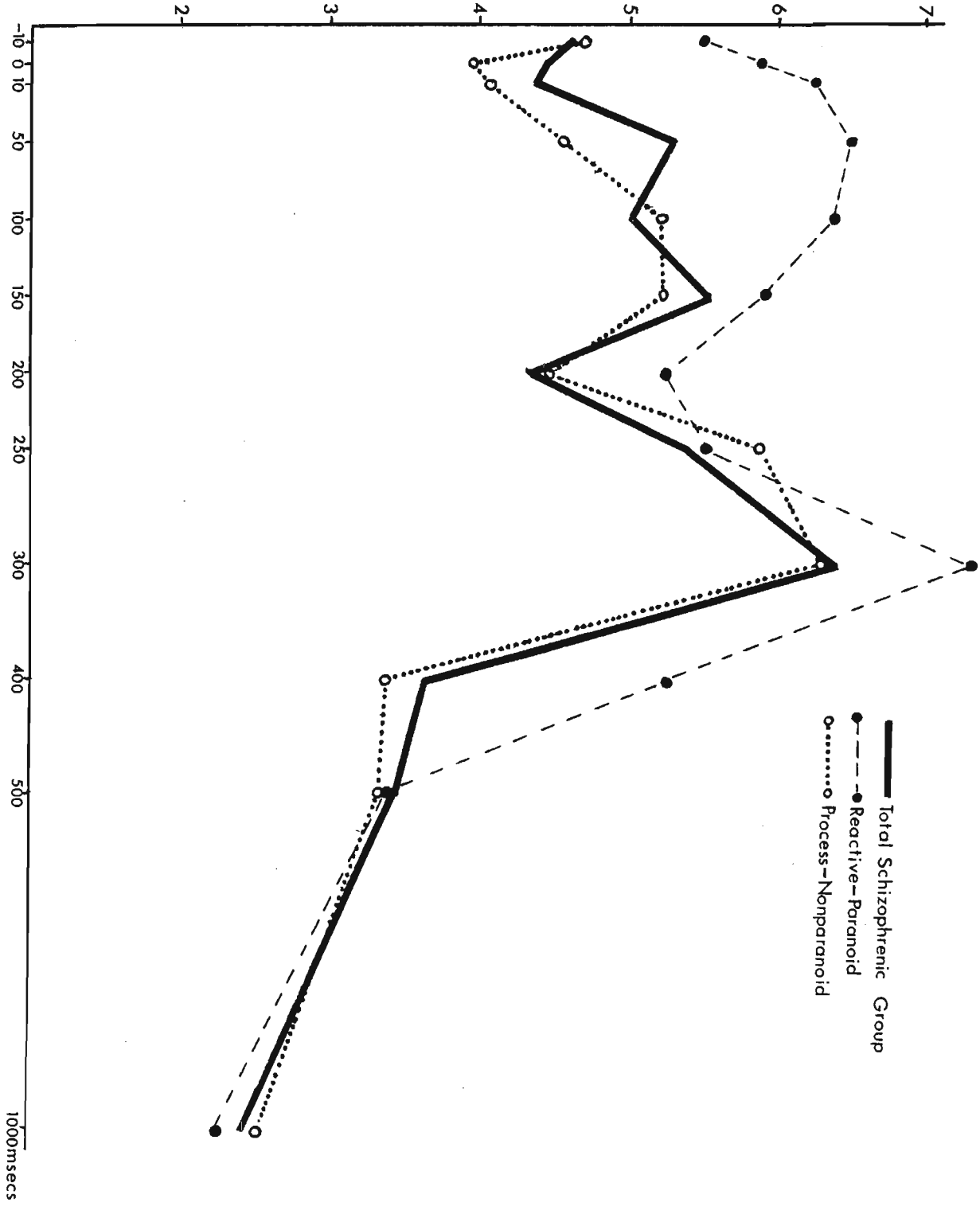
As with the Mackworth procedure, the data was reanalysed after dividing the schizophrenic group into reactive-paranoid and process-nonparanoid subgroups. The data for these two groups are given in Table 42 below.

TABLE 42 - MEAN DIGITS AVAILABLE TO REACTIVE-PARANOID AND PROCESS-NONPARANOID SCHIZOPHRENICS AT INCREASING DELAY INTERVALS

	-10	0	+10	50	100	150	200	250	300	400	500	1000
Reactive Paranoid (n = 8)	5,50	5,88	6,25	6,50	6,38	5,88	5,25	5,50	7,75	5,25	3,38	2,25
Process Non-paranoid (n = 19)	4,73	3,95	4,11	4,58	5,21	5,21	4,42	5,84	6,32	3,32	3,21	2,58

The same data are represented graphically in Figure 11 overleaf.

Figure 11 - Mean Number of Digits Available to Reactive-Paranoid and Process-Nonparanoid Schizophrenics at Increasing Delay Intervals



A two-way analysis of variance revealed no significant main effect of groups ($F =< 1$; df = 1,25) and no significant interaction between groups and delays ($F =< 1$; df = 11,297). The main effect of delays was significant ($F = 6,17$; df = 11,275; $p < 0,001$). Although not significant, the reactive-paranoid schizophrenics appeared to perform better than the process-nonparanoid schizophrenics at the shorter delay intervals.

11.3.3 Drug Effects

The mean overall scores of medicated and nonmedicated schizophrenics and psychiatric controls is given in Table 43 below.

TABLE 43 - MEAN TOTAL SCORES OF DRUG AND NONDRUG PATIENTS IN THE SCHIZOPHRENIC AND PSYCHIATRIC CONTROL GROUPS

	Drug (n = 23)	Nondrug (n = 17)
Schizophrenics	57,82	50,64
	Drug (n = 18)	Nondrug (n = 22)
Psychiatric Controls	62,05	59,68

A two-way analysis of variance showed no significant difference in the overall scores of medicated and nonmedicated patients, in either the schizophrenic or the psychiatric control group ($F = 2,23$; df = 1,76). It did not appear, therefore, as if medication affected the overall performance of these patient groups on the task.

11.3.4 Errors

The mean number of omission and commission errors made by the three major subject groups are given in Table 44 overleaf.

TABLE 44 - MEAN ERRORS OF OMISSION AND COMMISSION MADE BY SCHIZOPHRENICS, PSYCHIATRIC CONTROLS AND NORMALS

	Omission	Commission
Schizophrenics	23,10	12,90
Psychiatric Controls	18,92	13,62
Normals	23,45	13,10

As in the Mackworth procedure, all three subject groups made almost twice the number of omission as compared to commission errors. Given the lack of significance of between-group differences in all previous analyses, it seemed extremely unlikely that there would be any significant differences in errors of commission and omission among the three groups.

The extent to which subjects correctly reported a row of digits not asked for was noted. It was hoped that this measure would give an indication of response sets among the groups. The mean number of times each one of the three rows was inadvertently reported by the subjects in the three groups is given in Table 45 below.

TABLE 45 - MEAN NUMBER OF TIMES AN INCORRECT ROW WAS REPORTED

	Low	Medium	High
Schizophrenics	1,02	1,70	2,92
Psychiatric Controls	0,77	1,15	2,70
Normals	0,55	0,60	2,35

It can be seen from Table 45 that all three groups showed a tendency to inadvertently report the top row more often than the

bottom or middle rows.

This proclivity to attend to the top row is more clearly illustrated in Table 46 below. In this table, the mean percentage of correct responses to each row is given.

TABLE 46 - MEAN PERCENTAGE OF CORRECT RESPONSES TO EACH ROW

	Low	Medium	High
Schizophrenics	51,40	35,31	67,41
Psychiatric Controls	63,45	42,62	65,83
Normals	58,64	40,95	72,08

All three groups reported digits presented in the top row more accurately than in the middle or bottom rows. This finding is consistent with Sperling's (1960) observation that "the data clearly indicate that the top row is generally reported more accurately than the bottom row, although the instruction to report each row is given with equal frequency" (p.17).

On three types of error measurement, schizophrenics did not appear to show qualitatively different types of response tendencies to the two control groups.

Summary

On a procedure designed to assess the efficiency of processing from iconic storage, schizophrenics were not found to differ significantly in performance from either a psychiatric or a normal control group. Although not significant, normals were seen to perform better at longer delays than either of the two patient groups. None of the various subgroup approaches to schizophrenic samples produced significant differences between patient types. These findings contradict Cromwell's hypothesis concerning differential speed, or efficiency, of processing amongst high and low redundancy

schizophrenics. In addition, there was no evidence to suggest that schizophrenics display different response styles to normals and other psychiatric patients; the type and number of errors they committed on the partial report task were very similar to those of the other two groups. Medication was not found to affect the overall level of performance of either the schizophrenic or the psychiatric control group.

11.4 SPLIT-SPAN PROCEDURE

As the task was conducted under free recall conditions, the order of report was determined by the preference of the respondents. Strategies of recall were coded as ear order, temporal order or a combination order; the latter category referred to any order of report not subsumed under the former two types of recall strategy. Each one of the 24 sets of digits for each subject, was coded in this way and only those following ear order were used to assess the difference between recall of the first and second half sets. In addition, the following measures were obtained: overall level of recall, which referred to the total number of digits correctly recalled over the 24 sets; the number of digits correctly recalled from each ear; and lastly, the number of omission and commission errors.

The number of digits correctly recalled from the first and second half sets was expressed as a percentage of the number of digits in sets in which an ear order of recall was used. The mean percentage level of accuracy for the two sets in the three subject groups is given in Table 47 overleaf.

TABLE 47 - MEAN PERCENTAGE RECALL OF THE FIRST AND SECOND HALF SETS BY SCHIZOPHRENICS, PSYCHIATRIC CONTROLS AND NORMALS

	First Half Set	Second Half Set
Schizophrenics (n = 39)	98,88	60,41
Psychiatric Controls (n = 32)	99,40	59,81
Normals (n = 34)	99,61	69,36

It should be noted that 1 schizophrenic, 8 subjects in the psychiatric control group and 6 normals did not code any sets by ear order and therefore their responses could not be included in this analysis.

A two-way analysis with a repeated measure was computed using the method of unweighted means. No significant difference between the groups was found ($F =< 1$; df = 2,102) and the interaction between set and groups was not significant ($F =< 1$; df = 2,102). There was, however, a significant difference in recall of the two sets ($F = 76,58$; df = 1,102; $p < 0,001$). Therefore, although recall of the second half set was significantly poorer than recall of the first half set, schizophrenics did not differ from the two control groups in this respect.

11.4.1 Process and Reactive Subgroups

The same data for process and reactive schizophrenics is given in Table 48 overleaf.

TABLE 48 - MEAN PERCENTAGE RECALL OF THE FIRST AND SECOND HALF SETS BY PROCESS AND REACTIVE SCHIZOPHRENICS

	First Half Set	Second Half Set
Process Schizophrenics (n = 23)	98,57	58,43
Reactive Schizophrenics (n = 16)	99,31	63,25

Although the process schizophrenics scored lower than reactives on recall of the second half set of digits, this difference was not found to be significant ($F = < 1$; $df = 1,37$). Although the main effect of sets was significant ($F = 26,96$; $df = 1,37$; $p < 0,001$), the interaction between sets and groups was not ($F = < 1$; $df = 1,37$). Therefore process and reactive schizophrenics were not found to differ in the extent to which they recalled the second half set less adequately than the first half set.

The mean percentage recall of the two half sets by process and reactive psychiatric patients is given in Table 49 below.

TABLE 49 - MEAN PERCENTAGE RECALL OF THE FIRST AND SECOND HALF SETS BY PROCESS AND REACTIVE PSYCHIATRIC CONTROL PATIENTS

	First Half Set	Second Half Set
Process Psychiatrics (n = 14)	99,47	57,99
Reactive Psychiatrics (n = 20)	99,35	61,08

No significant between-group differences were found ($F = < 1$; $df = 1,32$), and the interaction between groups and sets was not significant ($F = < 1$; $df = 1,32$). The effect of sets was once again found to be significant ($F = 23,96$; $df = 1,32$; $p < 0,001$).

Therefore process and reactive psychiatric control patients were not found to differ significantly in their recall of either the first or the second half set of digits.

The scores from the two patient groups were recast to form a combined process and a combined reactive group. The data for these two combined groups is given in Table 50 below.

TABLE 50 - MEAN PERCENTAGE RECALL OF THE FIRST AND SECOND HALF SETS BY PROCESS AND REACTIVE PATIENTS (COMBINED GROUPS).

	First Half Set	Second Half Set
Process Patients (n = 37)	98,92	58,27
Reactive Patients (n = 36)	99,34	62,05

No significant between-group difference was found ($F = < 1$; $df = 1,71$). The main effect of sets was once again found to be significant ($F = 52,82$; $df = 1,71$; $p < 0,001$).

Therefore process and reactive subgroups could not be distinguished on the basis of their performance on the split-span procedure; recall of the second half set was almost half that of the first half set in both process and reactive patients, whether schizophrenics or psychiatric control patients.

11.4.2 Paranoid and Nonparanoid Schizophrenics

The mean percentage recall of paranoid and nonparanoid schizophrenics is given in Table 51 overleaf.

TABLE 51 - MEAN PERCENTAGE RECALL OF THE FIRST AND SECOND HALF SETS BY PARANOID AND NONPARANOID SCHIZOPHRENICS

	First Half Set	Second Half Set
Paranoid Schizophrenics (n = 12)	99,00	56,00
Nonparanoid Schizophrenics (n = 27)	98,82	62,37

The data was tested by a two-way analysis with a repeated measure. Although the main effect of sets was significant ($F = 25,98$; $df = 1,37$; $p < 0,001$), neither the main effect of groups ($F =< 1$; $df = 1,37$) nor the interaction between groups and sets was significant ($F =< 1$; $df = 1,37$). Therefore, paranoid and nonparanoid schizophrenics were not found to differ in their recall of the first or second half sets of the digits.

As with the previous two tasks, the data was recast in order to obtain the mean scores of reactive-paranoid and process-nonparanoid schizophrenics. As can be seen from tables 51 and 48, reactive and paranoid patients scored in the opposite directions; reactive schizophrenics recalled the second half set better than process patients, whereas paranoid schizophrenics recalled the second half set less well than nonparanoid schizophrenics. The combination of reactive and paranoid patients therefore acted to diminish the difference between the combined reactive-paranoid group and the combined process-nonparanoid schizophrenic group. For this reason, no statistical analysis was performed on this data. In the light of previous analyses, the differences between the two groups were extremely unlikely to be significant. These data are nevertheless given in Table 52 overleaf.

TABLE 52 - MEAN PERCENTAGE RECALL OF THE FIRST AND SECOND HALF SETS BY REACTIVE-PARANOID AND PROCESS-NONPARANOID SCHIZOPHRENICS

	First Half Set	Second Half Set
Reactive-Paranoid Schizophrenics (n = 8)	98,93	55,95
Process-Nonparanoid Schizophrenics (n = 19)	98,46	58,92

On the basis of the findings presented in sections 11.4.1 and 11.4.2, no differences in recall of the first or the second half set of digits could be found between any subgroups of schizophrenics. Both schizophrenic patients and subjects in the two control groups evidenced a good recall of the first half set of digits; recall of the second half set of digits was almost half that of the first set in all subject groups. These findings question the hypothesis that schizophrenics process information slowly or inefficiently. The data presented is consistent with inadequate storage of the second half set of digits, a characteristic common to all the subject groups studied.

11.4.3 Drug Effects

The mean overall scores of medicated and nonmedicated schizophrenic and psychiatric control patients are given in Table 53 below.

TABLE 53 - MEAN OVERALL RECALL OF DRUG AND NONDRUG SCHIZOPHRENIC AND PSYCHIATRIC CONTROL PATIENTS

	Drug (n = 23)	Nondrug (n = 17)
Schizophrenics	117,17	108,41
	Drug (n = 18)	Nondrug (n = 22)
Psychiatric Controls	111,27	119,81

A two-way unweighted means analysis revealed a significant interaction between diagnosis and medication ($F = 6,95$; $df = 1,76$; $p < 0,05$). Neither the main effects of diagnosis ($F = < 1$; $df = 1,76$) nor medication ($F = < 1$; $df = 1,76$) were significant. An analysis of the main effects of the interaction showed that nonmedicated schizophrenics scored significantly lower on overall recall than nonmedicated psychiatric patients ($F = 6,04$; $df = 1,76$; $p < 0,05$). No other effects were significant. Therefore, no differences were found between medicated and nonmedicated patients in the two groups.

11.4.4 Strategies of Recall and Errors

Each set reported was coded to indicate one of three strategies of recall: by ear, by order of arrival, or some combination strategy other than by ear or order. The mean number of times each of these strategies was used by the three major subject groups is shown in Table 54 below.

TABLE 54 - MEAN NUMBER OF TIMES EAR ORDER, TEMPORAL ORDER OR COMBINATION STRATEGIES OF RECALL WERE USED BY SCHIZOPHRENICS, PSYCHIATRIC CONTROLS AND NORMALS

	Ear Order	Temporal Order	Combinations
Schizophrenics	15,32	1,60	6,85
Psychiatric Controls	9,72	3,95	10,20
Normals	10,70	4,20	8,90

A two-way analysis of variance with repeated measures showed that the main effect of strategies ($F = 41,52$; $df = 2,234$; $p < 0,001$) and the interaction between strategies and groups were significant ($F = 5,01$; $df = 4,234$; $p < 0,001$). An analysis of the simple main effects showed that there were significant differences between the groups in the use of all three strategies (see Appendix A, IX for summary tables). Schizophrenics used ear

strategies more often, than the two control groups.

All three groups of subjects showed a tendency to report material presented to the right ear more accurately than material presented to the left ear. The percentage of recall for the two ears is given in Table 55 below.

TABLE 55 - MEAN PERCENTAGE RECALL OF DIGITS PRESENTED TO THE LEFT AND RIGHT EARS

	Left Ear	Right Ear
Schizophrenics	70,03	87,81
Psychiatric Controls	75,16	86,11
Normals	81,22	87,77

All parts of the analysis were found to be significant: the main effect of ears ($F = 48,77$; $df = 1,117$; $p < 0,001$), the main effect of groups ($F = 3,39$; $df = 2,117$; $p < 0,05$) and the interaction between groups and recall by ear ($F = 3,54$; $df = 2,117$; $p < 0,05$). Schizophrenics showed a significantly greater discrepancy in recall between the two ears as compared to normals.

The data presented in Tables 54 and 55 indicate that the schizophrenic group tended to approach the task in a qualitatively different way from the two control groups: they showed a greater reliance on ear order strategies of recall and showed a more pronounced bias towards more accurate recall of material presented to the right ear.

The mean number of errors of omission and commission made by the three major subject groups is shown in Table 56 overleaf.

TABLE 56 - MEAN ERRORS OF OMISSION AND COMMISSION MADE BY SCHIZOPHRENICS, PSYCHIATRIC CONTROLS AND NORMALS

	Omission	Commission
Schizophrenics	22,25	9,12
Psychiatric Controls	22,02	6,10
Normals	18,50	4,45

Although the normal control group made fewer errors than the two patient groups, all three subject groups tended to make fewer errors of commission than omission. The proportion of these two types of errors in the three groups was very similar.

Summary

As indicated in Chapter 10, the use of the split-span procedure has been suggested on the basis of Broadbent's (1958) theory, in which it was held that defective recall of the first and second half set of digits indicated malfunctioning of the processing system. Defective recall of the second half set of digits only was held to indicate lack of storage capacity. All three subject groups in this study showed poorer recall of the second as compared to the first half set of digits. No significant differences in this pattern were found between normals, psychiatric controls and schizophrenics. In addition, no subgroups of schizophrenics could be differentiated on the basis of the task; a finding which questions the hypothesis regarding slow processing in schizophrenics generally, or in any particular subgroups of schizophrenics. Medicated and nonmedicated schizophrenics and psychiatric control patients were not found to differ in their overall level of recall of digits across all 24 sets. Although schizophrenics did not appear to make different types of errors as compared to the control groups, data were presented which indicate that schizophrenics showed different strategies of recall from normals and psychiatric control patients.

11.5 ANXIETY AND EDUCATION

The effect of state anxiety and level of education received on task performance was assessed by means of product-moment correlations between these measures and the overall scores obtained on the three tasks. These correlations are presented in Table 57 below.

TABLE 57 - PRODUCT-MOMENT CORRELATIONS BETWEEN OVERALL PERFORMANCE AND ANXIETY AND EDUCATION

	Mackworth's (1965) Procedure	Partial Report Procedure	Split-Span Procedure
State Anxiety	-0,11	-0,13	-0,234 **
Number of Years of Education Received	0,06	0,25 **	0,251 **

(** = p 0,01; df = 118)

State anxiety correlated negatively with performance on the split-span procedure, but its relationship to overall performance on the two other tasks was not significant. Level of education received was found to correlate positively with performance on both the split-span procedure and on partial report.

The implications of the results presented will be discussed in Chapter 12.

S E C T I O N T H R E E

CHAPTER 12 - DISCUSSION OF THE INFORMATION PROCESSING STUDY

12.1 MACKWORTH'S PROCEDURE

12.2 PARTIAL REPORT PROCEDURE

12.3 SPLIT-SPAN PROCEDURE

12.4 CROMWELL'S THEORY - EVALUATION

12.4.1 Empirical Evidence

12.4.2 Theoretical Evaluation

12.4.3 Subgroup Differences

12.5 GENERAL DISCUSSION OF THE STUDY

12.6 AN ALTERNATIVE DIRECTION FOR RESEARCH

SECTION THREE

CHAPTER 12 - DISCUSSION OF THE INFORMATION PROCESSING STUDY

In this chapter, the results presented in Chapter 11 will be discussed in detail. The results obtained from the use of each of the three procedures will be discussed separately. Following this, Cromwell's theory of stimulus redundancy will be evaluated in the light of the findings presented.

The aim of this part of the study was to test two hypothesized correlates of high or low redundancy categorization: According to Cromwell (1968, 1972, 1975), high redundancy schizophrenics are characterized by narrowed attention and slow processing whereas broadened attention and fast processing are characteristics of low redundancy schizophrenics. The primary classification into high and low redundancy groups is based on the distinction between process and reactive schizophrenics, although in his earlier papers (1968, 1972), Cromwell hypothesized that reactive-paranoid and process-nonparanoid schizophrenics would show cognitive functioning indicative of low and high redundancy individuals, respectively. For this reason, both these subtype classifications were used to test his theory.

12.1 MACKWORTH'S PROCEDURE

Drawing on the work of Venables (1964) and Silverman (1964a & b), Cromwell hypothesized that high redundancy schizophrenics would show evidence of restricted attentional fields whereas low redundancy schizophrenics would be extensive in their attentional behaviour. In Chapter 8 it was pointed out that there was a high degree of consistency amongst the theories reviewed about the existence of two groups of schizophrenics differing in the range of their attention; some theorists saw these two groups as identifiable by the acute-chronic dimension, some by the process-reactive dimension and some by the paranoid-nonparanoid dimension .

At least part of the meaning of the breadth of attention is related to the "spatial extensity of peripheral vision" (Cegalis et al, 1977, p.471). Cegalis et al (1977) assessed the peripheral visual discrimination of chronic and acute schizophrenics and members of the hospital staff. They took broadened attention to refer to "hyperextensity of more efficient selective strategies in regions typically associated with less efficient strategies", and found that acute schizophrenics showed broader attention than normals.

In this study, breadth of attention was operationalized in a manner comparable to the Cegalis et al study, and was taken to refer to "the useful field of view". Mackworth (1965) defined this as "the area around the fixation point from which information is briefly stored and read out during a visual task" (p.68). The useful field of view includes those parts of the visual field beyond foveal vision which are essential to peripheral matching and recognition. Mackworth demonstrated that "noise" resulted in a reduction of this field of view, leading to a state of induced tunnel vision. He concluded that the useful field of view "varied in width from moment to moment according to the amount of information on the display" (p.68).

According to Cromwell's stimulus redundancy theory, low redundancy schizophrenics, who have a widened attentional field and a preference for high density information loads, should show less of a reduction in the useful field of view than low redundancy schizophrenics. Mackworth's (1965) procedure was used to test this prediction. Although both the level of noise and the extent of target separation were found to significantly affect the performance of all groups, no significant differences were found between normals, psychiatric controls and schizophrenics. Although reactive patients, both schizophrenic and psychiatric control, discriminated the targets more accurately than process patients when no noise was present, these differences were not found to be significant. The only two significant subgroup findings obtained were both contrary to Cromwell's prediction: nonparanoid schizophrenics obtained higher scores than paranoid patients at two levels of wider target

separation, and reactive-paranoid schizophrenics were found to perform significantly more poorly when the targets were widely separated than when they were closer together.

Therefore the results obtained oppose Cromwell's theory with regard to breadth of attention in low redundancy schizophrenics. They are also contrary to Postman's (1974) results which indicated that paranoid schizophrenics were more sensitive than nonparanoid patients on a signal detection task. However, Russell et al (1976, 1977, 1980), using a visual search procedure not unlike the task employed in the present study, failed to find significant differences between schizophrenics and normals and between paranoid and nonparanoid schizophrenics. On a test of the breadth of cue utilization, Feeney (1972) failed to find significant differences between acute schizophrenics and normals, although chronic schizophrenics performed more poorly than both these groups. Therefore the present results are not unlike findings which have been previously reported.

Further discussion of these findings will take place in a more general context after the results obtained with each procedure have been commented upon.

12.2 PARTIAL REPORT PROCEDURE

Slow processing, as assessed by this procedure is similar to what Yates intended when he referred to dichotic listening as a measure of processing speed. That is, a storage system of large capacity but short duration is assumed in both Sperling's and Broadbent's models. Information represented in this store which is not transformed or processed will decay within a very short period. This is the foundation for the assumption that the level of response reflects the speed with which information is processed from the store into a more durable short term memory system. In Chapter 10 the argument was developed that the level of response might more correctly be thought to reflect efficiency of processing as a more general description than speed of processing from echoic or iconic store to short term memory. This was based on Dick's (1974) assertion that "capacity" was a primary determinant of rate of processing, and that

capacity itself would depend on strategies of coding, amongst other things.

Cromwell proposed that low redundancy schizophrenics would process information at a faster rate, or in these terms, more efficiently than high redundancy schizophrenics. In this study, although normals appeared to have available a larger number of digits at longer delays than psychiatric control patients or schizophrenics, no differences between these three groups reached significance. A number of authors have proposed that the icon of schizophrenics may last longer and therefore result in the confounding of two icons (Saccuzzo et al, 1974; Knight et al, 1978; Steronko & Woods, 1978). However none of these authors had included delays longer than 300 msecs. Knight et al (1977) used a partial report procedure with delays up to 600 msecs and found no differences in the performance of process and reactive schizophrenics; they did not include a normal control group, so no comparison with such a group was possible. In the present study, with delays up to 1000 msecs, no evidence was found to support the notion of a lingering icon in schizophrenics.

Reactive patients, both schizophrenic and psychiatric controls, tended to perform better on the whole than process patients, but no differences reached significance. Similarly, although paranoid schizophrenics had more digits available at shorter delays than nonparanoids, no significant differences between these two groups were found. Reactive-paranoid patients appeared to perform very much better than process-nonparanoid patients with delays up to 500 msecs, but again the difference between groups did not reach significance. Therefore, while there were indications that low redundancy schizophrenics may be more efficient processors of information than high redundancy schizophrenics, the finding was not significant.

Knight et al (1977, 1978) similarly failed to find significant differences between process and reactive schizophrenics on comparable procedures. Saccuzzo et al (1974), using a backward masking task,

found that paranoid patients performed significantly more poorly than nonparanoid schizophrenics and that normals performed significantly better than both schizophrenic groups. However, it should be noted that the schizophrenics tested in this study were generally chronic patients and the normal group was made up of college students. Significant differences between such groups are to some extent expected. In a further study, Saccuzzo & Miller (1977) concluded that schizophrenics, with practice, reach the performance levels of normals. The findings of this study are therefore consistent with previous investigations of the efficiency of processing from iconic storage.

12.3 SPLIT-SPAN PROCEDURE

In advocating the use of dichotic stimulation procedures, Yates (1966b) drew primarily on a study by Inglis & Caird (1963). Using the split-span version of dichotic presentation, these authors found that recall of the first half set of digits was unimpaired but that recall of the second half set deteriorated with increasing age. These findings were interpreted within Broadbent's 1958 model and taken to indicate that the processing or p system was intact in older individuals but that they suffered from a short term memory impairment.

To the greatest extent however, the research in the field of schizophrenia using dichotic stimulation procedures have employed variations of shadowing and interference. These techniques, according to Moray (1969), are suited to assessing selective attention, rather than the functioning of the p system as envisaged by Yates. Some of the relevant studies were reviewed in Chapter 9. The authors of one of the most recent studies of this kind, Straube & Germer (1979), found no differences between acute schizophrenics and normals. They concluded that no selective attention deficit was evident in this group of schizophrenics and that significant differences were only likely to be found when the schizophrenic sample was predominantly chronic.

Hawks & Robinson (1971) used a complete recall condition and found no differences between normals and schizophrenics in their ability to recall the first half set of digits. Between-group differences in the ability to recall the second half set were however found. Although Lerner et al (1977) used the split-span procedure, they did not analyse their results in terms of differential recall of the two sets.

In the present study no significant differences were found between normals and psychiatric patients or between any subgroups of schizophrenics in their ability to recall the first half set. Therefore no evidence was found to indicate malfunctioning of the p system or slow processing amongst schizophrenics or any subgroup of schizophrenics. Cromwell's hypothesis regarding slow processing amongst high redundancy schizophrenics was not supported.

However, some interesting differences in the approach to the task were found between schizophrenics and the two control groups. No such differences were evident on the two previous procedures; on the Mackworth procedure, schizophrenics showed a similar number and type of error as compared to the control groups. On the partial report procedure, the three groups showed the same proportion of omission as compared to commission errors and all three groups evidenced a tendency to report the top row most accurately and the middle row least accurately. This bias toward the top row is a familiar tendency on the task (Sperling, 1960; Dick, 1974). However, on the dichotic listening task, schizophrenics differed significantly from the control groups in two respects: firstly, they demonstrated a preference for an ear-by-ear recall strategy and secondly, they had a greater discrepancy in the accuracy of recall from the right and left ears as compared to the control groups. These two findings will be discussed separately below.

Bryden (1962 in Moray, 1969) observed that if listeners are uninstructed as to recall, a wide variety of strategies become evident including ear order, temporal order, attempted-ear order and "knight's move" order. However, recall strategy has been found to

be related to speed of presentation. At fast rates of presentation (1 pair of digits/½ second), a preference is shown for ear-by-ear recall; at slow rates (1 pair/2 seconds) temporal order strategies predominate. At intermediate rates (1 pair/1 second) preference for these two strategies has been found to be about equal (Bryden, 1964). In this study schizophrenics showed a significant preference for ear-by-ear strategies of recall as compared to the control groups. This preference by schizophrenics was also found by Lerner et al (1977).

A right ear superiority for verbal material and a left ear superiority for nonverbal material has been consistently documented in investigations using dichotic stimulation (Moray, 1969). Geffen (1978) found that children between the ages of 6 and 8 years acquired the ability to overcome the right ear bias in report. Inglis & Sykes (1967) found that order of report determined accuracy to a greater extent than ear of report in a study of these two factors in children. In the present study and in that of Lerner et al (1977), schizophrenics were found to show a significant discrepancy between the two ears. This ear difference in schizophrenics could be due to their greater reliance on an ear-by-ear recall strategy, or it could reflect a consistent difference in strategy between schizophrenics and other groups. The potential benefits of examining such strategy differences will be examined in more detail later.

12.4 CROMWELL'S THEORY - EVALUATION

Before proceeding to a more general discussion of the study and directions for future research, the present findings will be examined in the light of Cromwell's stimulus redundancy theory.

12.4.1 Empirical Evidence

None of the results of this study positively support either of the two hypotheses examined; that is, greater breadth of attention and speed of processing amongst low redundancy schizophrenics and vice versa amongst high redundancy patients. On the partial report task

a tendency for low redundancy schizophrenics to perform better than high redundancy schizophrenics at shorter delays was evident but not significant. However, on the Mackworth procedure, positive evidence against Cromwell's theory was produced: the performance of low redundancy schizophrenics was found to deteriorate significantly when targets were placed in peripheral versus foveal vision, a finding which contraindicated broadened attention amongst this group of patients.

12.4.2 Theoretical Evaluation

A number of theoretical difficulties are evident in Cromwell's theory:

- the primary identification of high and low redundancy individuals is problematical. In his 1968 paper Cromwell explicitly related the low and high redundancy classification to the reactive-paranoid and process-nonparanoid categories respectively (p.367). However, in the presentation of evidence for reliable differences between two groups of schizophrenics, he drew on findings based almost exclusively on the process-reactive distinction. In addition, in his 1975 paper he argued that paranoid status, amongst other aspects of clinical presentation, may contribute little to our knowledge about schizophrenia. As cognitive differences between high and low redundancy schizophrenics are still hypothetical, it is unclear how such groups should be identified; that is, whether paranoid status should be retained as an additional classificatory principle to process-reactive ratings.

- The adequacy of a distinction between process and reactive schizophrenics as the basis for classification of cognitive functioning was investigated in the first part of this study. It was concluded that the process-reactive distinction probably reflected extrinsic factors, notably social competence, and that there was no clear rationale for expecting cognitive functioning and social competence to be interrelated in a unique way in schizophrenics.

- In a simple sense, the redundancy distinction, as derived from the Pribram & Melges (1969) formulation, appears to refer to stimulus avoiders versus stimulus seekers. Although this variable might covary with rate of processing, it might not be appropriate to equate the two. One could, for example, conceive of a schizophrenic classified as high redundancy, fixating on a single object, point or part of a stimulus, but ruminating on it. Or alternatively, processing deeply, in the Craik & Lockhart (1972) sense of deep, that is elaboratively. Therefore, rate of processing may not be an adequate translation of the essence of what is intended by the redundancy construct; further, rate of processing may not be an appropriate inference of the determinants of the level of responses on information processing tasks, as was argued in Chapter 10.

While Cromwell's attempt at a theoretical integration of subgroup differences and cognitive functioning is praiseworthy, the theory requires specification in two respects: firstly, the criteria for identifying high and low redundancy schizophrenics and secondly, operational procedures within current paradigms of cognitive psychology with which to test the construct of stimulus redundancy.

12.4.3 Subgroup Differences

Cromwell's theory depends on the existence of at least two reliably discriminable subtypes of schizophrenics who show clear and consistent differences in cognitive behaviour. In this study no significant differences were found in the performances of such identifiable subgroups. These findings are consistent with the majority of the studies reviewed in Chapter 9. Even with the one function on which fairly consistent normal-schizophrenic differences have been found, span of apprehension, no significant subgroup differences have been reported (for example, Spohn et al, 1970; Neale, 1971).

While subdividing the schizophrenic group into process and reactive patients might have some purpose for prognostic assessment, there seems little reason at present, to expect that such subgroups will

be found to differ on information processing tasks. Until more precise differences between normals and schizophrenics have been isolated and stipulated there might be little point in expecting that differences within the schizophrenic group will be located. Rather, dimensions such as the process-reactive distinction should be retained as subject variables for the purpose of studying more homogeneous groups. This was the approach adopted by Hemsley (1976a).

In conclusion, Cromwell's theory, as articulated in his 1968, 1972 and 1975 publications, was found to lack both theoretical and empirical support. The process-reactive dimension, while useful for the purposes of prognostic assessment, is unlikely to provide a substantial basis for differentiating the cognitive functioning of schizophrenics. No empirical support was found for Cromwell's stimulus redundancy theory, as it presently stands, within the paradigm of information processing. A possible alternative direction for future research will be offered in a later section of this chapter.

12.5 GENERAL DISCUSSION OF THE STUDY

Some aspects of the present study, not previously discussed, merit comment:

- the effects of medication on the performance of schizophrenics: No significant differences were found in this study between the performance of medicated and nonmedicated schizophrenics. These results are consistent with the findings of the majority of studies reviewed in Chapter 9 (for example, Rappaport, 1966; Rappaport et al, 1967; Neale et al, 1969; Spohn et al, 1970; Nideffer & Cromwell, 1972; Postman, 1974; Russell & Page, 1976; Cegalis et al, 1977; Schwartz-Place & Gilmore, 1980). In fact, the studies of Stone et al (1969) and Davidson & Neale (1974) were amongst the few which found significant drug effects on information processing tasks. It appears, therefore, that while medication might produce quite striking effects on the clinical picture of

schizophrenics, these are unlikely to be reflected at the level of behaviour assessed by information processing tasks. This observation raises the question of why it has been assumed that the striking clinical differences between schizophrenics and other psychiatric patients, for instance, should be reflected at this level of assessment. Such questions will be raised again in this chapter when an alternative direction is suggested.

- the significant correlations with education: In this study, education was found to be significantly related to overall level of performance on both the partial report and split-span procedures. This result is contrary to the majority of the findings reviewed in Chapter 9; a number of studies which had employed information processing measures had not found any correlation between performance and education (Neale et al, 1969; Nideffer & Cromwell, 1972; Russell & Page, 1976; Russell & Knight, 1977; Saccuzzo & Miller, 1977; Russell et al, 1980; amongst others). However, Cash et al (1972) found that education correlated with one level of task performance on a full report technique and Hemsley (1976b) found a positive correlation between I.Q. and 3 measures on a choice reaction time task. Two papers have indicated a positive relationship between I.Q. and the ability to process information accurately (Eysenck, 1967, quoted by Hemsley, 1976b and Friedman, 1966, quoted by Alumbaugh & Sweeney, 1973). The issue obviously requires resolution, but the lack of significant differences in I.Q. or education between the three subject groups in this study can be taken to indicate that the present results were not due to these factors.

- the effects of anxiety on task performance: The author could not find any other information processing study of schizophrenia which had attempted to evaluate the effects of anxiety on task performance. In the present study self-rated state anxiety was not found to be correlated with performance on either the Mackworth or the partial report procedure. However, higher levels of anxiety were related to lower levels of performance on the split-span procedure, and significant differences in state anxiety were

found between the three groups. In view of the lack of significant differences between the three groups in terms of overall level of performance however, it would appear that the information processing measures employed were insensitive to differences in anxiety levels.

- the effects of practice on task performance: The paradigms in which information processing approaches have developed have usually employed a small number of highly practised individuals (for example, Sperling, 1960). In the studies reviewed in Chapter 9, few research designs allowed for extended practice by subjects. As Knight et al (1977) admit, in relation to Sperling's procedure, this involves an extensive modification of the original model. Similarly, in the present study, little practice was afforded subjects except insofar as to assess their ability and comprehension to perform the task. While practice does not appear to affect performance on dichotic stimulation tasks (Broadbent, 1958; Moray, 1969), the same cannot be said for tasks involving the brief presentation of visual stimuli. For example, Saccuzzo & Miller (1977) found that with practice schizophrenics were able to achieve the same level of performance as normals. Simon (1979), quoting the work of Shiffrin & Schneider (1977), who he says "have produced considerable evidence, in the context of a simple search and detection task, of a contrast between controlled processing of relatively novel tasks and automated processing of the same tasks after extensive practice. On the basis of the size of effects and the difficulty of reversing them, they argue for a qualitative difference between the two kinds of processes" (p.388). Research in the field of schizophrenia up to this point has mainly explored what, in Simon's view, would be considered to be conscious or controlled processing and cannot always be seen to be comparable to results produced under circumstances of extensive practice.

- technical difficulties involved in information processing tasks: Mollon & Polden (1978) examined a large number of commercially produced tachistoscopes and concluded that the time constants of tachistoscope lamps were often longer than specified in manuals.

On the basis of their investigation they recommended that conventional equipment was suitable for situations in which a tachistoscope was being used simply to ensure a controlled exposure, as for example, in the Mackworth procedure. However, when exposure durations were critical, as for example, in backward masking, conventional tachistoscopes should be avoided. Their report raises the issue of constant calibration of often unstable equipment. The delay between stimulus offset and tone on the partial report procedure used in this study was not calibrated during the investigation, and reports in the field of schizophrenia are marked by the absence of sensitivity to such technical issues. Similarly, the synchronization of digits in dichotic stimulation experiments has been severely criticized and computer generated stimulus material has been recommended (Yates et al, 1969, 1972; Kantowitz, 1974).

Nuechterlein (1977) is correct in observing that only the roughest start has been made in the application of sophisticated information processing models to investigations of schizophrenia. Very little has yet been done to deal with the problems raised in this discussion and a number of other issues have still to be confronted:

- for example, the extent to which experimental tasks "can be assumed to reflect an underlying deficit in some single process such as attention" (Kopfstein & Held, 1972; p.294). Substantial leaps are often made in reports of schizophrenia studies from single tasks to all-encompassing functions such as attention. As Treisman (1969) commented, words such as "attention" and "input" have been used to cover a variety of logically different concepts. Nowhere is this more evident than in schizophrenia research where global deficits have often been assumed to be confirmed on the basis of evidence gathered from highly divergent sources.

- Rabbit (1979) has cautioned that models such as those being employed in the elementary information processing approach can, by stipulating independent operations for testing performance, create the illusion that independent functions or subsystems exist.

This danger can be illustrated with reference to authors, quoted earlier, who have suggested that schizophrenics may have persistent iconic imagery, and that this would lead to a confounding of images as a new icon was formed. Implicit in such an hypothesis are the assumptions that the overlap of iconic images constitutes a basis for misperceptions in everyday life and that, in schizophrenics, overlapping iconic images occur and are related to the perceptual incongruities they are reported to experience. Saccuzzo et al (1974) made this reasoning explicit by arguing that "the two icons could mix and confound each other resulting in distorted and inaccurate perceptions" (p.518). This can be contrasted with a comment by Dick (1974) to the effect that the function of iconic memory "would appear to be to maintain an internal representation of the stimulus so that processing may proceed. As such, the icon may be viewed as an artefact of the tachistoscopic procedure, since in the natural environment the duration of the stimulus is seldom restricted" (p.583). While the stimulus is probably restricted by succeeding fixations, the point is made that there is no simple relationship between behaviour elicited in such controlled situations and behaviour in everyday life. The problems in making the transition between these two situations has led to disillusion with laboratory-produced phenomena among some cognitive psychologists. This is evident in Neisser's (1974) concluding remarks in a review of a text on information processing: "There is another research strategy we might pursue. Leaving our paradigms behind, we might try to understand how people function in the world at large: how they grow up, what skills they acquire, how they are influenced by society, what they care about" (p.402).

In the eagerness to find experimental foundations for the bewildering cognitive functioning of schizophrenics, many complex and difficult issues are being overlooked or bypassed. For example, Spring & Zubin (1979) asserted that "Disturbances of information processing have a prima facie link with schizophrenic psychopathology because patients' subjective complaints so often include altered

perceptual experience, distractibility, flooding or loss of the ability to differentiate figure from ground. Even if these disturbances do not produce or cause schizophrenia, they may serve as 'culture-free' markers of the disorder or vulnerability to it" (p.289). Such assertions are premature and do not facilitate clarity in thinking about future directions for research. Before more energy is expended in trying to improve present research trends, both technically and theoretically, a careful and critical analysis is required to ascertain the most fruitful direction to take. At the risk of falling prey to the errors that have been judged in others, an alternative direction will be proposed.

12.6 AN ALTERNATIVE DIRECTION FOR RESEARCH

Recently a debate has emerged in the field of cognitive research in schizophrenia regarding the appropriate research strategy to be adopted. Spring et al (1977) and Chapman & Chapman (1977) have advocated that studies seeking to establish the existence of a cognitive deficit should be abandoned and that the goal of demonstrating differential deficits be adopted. By differential deficit is meant a greater deficit on one task than on another. On the other hand, Strauss (1979) has said that "an understanding of how schizophrenics process information in tasks is propaedeutic to the use of information processing tasks to measure deficits in inferred processes or abilities, and to the study of whether they are differential deficits" (p.319). Within what paradigm, however, can the manner in which schizophrenics process information be studied?

Atkinson & Shiffrin (1968, in Sharratt, 1980) and Shiffrin & Geisler (1973) have explained information processing in terms of a distinction between fixed and variable aspects of processing. Fixed aspects refer to, for example, structure and capacity. Iconic memory is regarded by these authors as an example of a fixed attribute of processing; information is encoded automatically at this stage and without attentional control on behalf of the subject. Variable aspects, strategies or "control processes" are seen to be largely short term memory functions and are defined as "labile,

choosable strategies which can be adapted to suit environmental and task conditions" (Shiffrin & Geisler, 1973, p.55). Scanning and response decisions would be regarded, amongst others, as control processes. These strategies are thought of as optional plans for solving problems; transiently adopted tactics which are dependent on such factors as the nature of the task, the intention of the subject and their past history.

The approach adopted in cognitive research in schizophrenia thus far would seem to have concentrated on finding deficits in the fixed or structural aspects of processing, such as deficits in the selectivity of attention. There are, however, a number of reasons why investigations of strategies might be a more fruitful direction:

- The notion that the cognitive system was structurally fixed could not account for the considerable flexibility of performance of which individuals are capable. The idea of strategies or control processes were introduced, in one sense, in an attempt to explain the observed inter- and intra-individual variability in information processing (Sharratt, 1980). Such an aim has considerable appeal, in itself, for conceptualising schizophrenic deficits, considering that variability is so consistently found amongst schizophrenic groups. The author believes this is the spirit in which Nolan & Anderson (1973) and Strauss (1979) recommended that we should study how schizophrenics process information.

- The author believes that the evidence reviewed in this work has been disappointing with regard to the discovery of differences between schizophrenics and normals in their information processing capacities. The tasks used have been largely ones which assess fixed aspects of processing, and they have, in general, been insensitive to the obvious differences between schizophrenics and other groups. Neale et al (1969) argued that such tasks were insensitive to differences in motivation; the review of literature in this study certainly suggests their insensitivity to drug effects and changes in clinical presentation which accompany

pharmacological treatment. Further, investigations of acute patients which have revealed no normal-schizophrenic differences are indicative of the insensitivity of the approaches taken to what are startling differences in everyday behaviour.

- The arguments put forward thus far have certainly been recognised by other writers. Marshall (1973) and Russell & Page (1976) amongst others, have indicated that response selection and decision factors may be more important in delineating the schizophrenic deficit than attentional or perceptual factors. In his review, Zubin (1975) concluded that "the deviations that are observed are due not to an intrinsic deficit in selective attention, but to such factors as the 'culture' of the schizophrenic, his previous history and reinforcement experience which makes him classify the environmental stimuli in accord with a system uniquely his own" (p.160). Schneider (1976) concluded that "the results of this study suggest that this cognitive disorder ('sufficient to warrant hospitalization') represented more the unusual manner in which schizophrenics allocate their attention than any breakdown in their ability to attend" (P.173).

The author believes there is already some evidence to support the viability of concentrating research effort on the strategies schizophrenics adopt towards information processing tasks.

Rochester (1973) found that schizophrenics had no difficulty in locating dichotically presented clicks in the context of alternating sentences and numbers. However, they were less able than normals to take advantage of the blocking of sentences and numbers. That is, they could be seen to be unable to employ an optimal strategy. A similar interpretation can, and has been placed on a number of findings. For example, Friedrich, Emery & Fuller (1974) concluded that schizophrenics were "not as able as normals to utilize organizational cues or aids for optimum information processing" (p.587). Oltmanns & Neale (1975) interpreted the schizophrenic deficit on longer, but not shorter, digit spans as the result of an

inability to "chunk" the information. Schwartz-Place & Gilmore (1980) using Broadbent's (1977) two-stage model of processing from global to detailed analyses, concluded that schizophrenics used detailed analyses, even when global strategies were more appropriate. Employing a distinction between passive and active processing, Oltmanns (1978) and Koh & Peterson (1978) regard the schizophrenic as only showing deficits when active processing is required. This distinction corresponds to that proposed by Shiffrin & Geisler (1973) between automatic and control processes.

Other authors do not arrive at conclusions so explicitly related to the concept of strategies as outlined but their comments may be seen to be relevant. For example, Cegalis et al (1977) concluded from their investigation of peripheral visual discrimination that schizophrenics use different selective attention strategies as compared to normals. Dykes & Mc Ghie (1976) compared the performance of schizophrenics and highly creative individuals on a number of attentional tasks. They found no differences between the structure of attention in the two groups, but differences in the manner in which attention was deployed.

Although the application of a model utilising fixed and variable attributes of processing to schizophrenia research is highly speculative, it would appear to be a fruitful alternative to existing interpretations of deficit. The nature of strategies, the specification of what constitutes optimal strategies and the bases of strategy decisions still have to be explored. However, a change in direction along the lines discussed, suggests an interesting rapprochement between the work conducted over the last 10 years on information processing and schizophrenia and some current trends in cognitive psychology.

CHAPTER 13 - CONCLUSIONS

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In this study Cromwell's (1968, 1972, 1975) theory of stimulus redundancy was examined in two stages: firstly, by questioning the basis of his distinction between high and low redundancy schizophrenics, that is, the process-reactive dimension; and, secondly, by utilizing an information processing approach to test some of the hypothesized correlates of high and low redundancy classification.

It was concluded that the distinction between process and reactive schizophrenics had a certain pragmatic utility in prognostic assessments, but that the dimension formed an insufficient basis for expectations that patients so classfied should differ in cognitive functioning. Further, no evidence was found to suggest that schizophrenics identified as high or low redundancy did differ in their cognitive functioning as assessed in the study. It was suggested that a potentially more successful direction for schizophrenia research lay in investigations of the manner in which schizophrenics deployed their cognitive capacities.

This research was conducted and terminated in the knowledge that the approach taken and the tradition in which the study is located has insulated itself from confronting several major controversies.

Only two prominent authors in this field of research have attempted to answer the fundamental question, posed by one of them in the following way: "What do these minute differences found in the laboratory have to do with gross schizophrenic behaviour as perceived in life?" (Zubin, 1975; p.162). Zubin concludes that the deviations evident in clinical appraisals of schizophrenics may be epiphenomena of the combined effects of such factors as crossmodal retardation, the greater influence of uncertainty on schizophrenics' reaction time performance and narrowed scanning. Cromwell (1979), recognising that "no one has been taken into psychiatric treatment because of overestimating the size of visual stimuli" (p.327),

argues along the same lines as Zubin and concludes that: "In order to explain schizophrenia, perhaps these more subtle, more tolerable but probably more stable, manifestations are more important than the variably expressed incursive symptoms which jar the tolerance of most people on earth" (P.328). However, as indicated in the previous chapter, there are no clear and direct relationships between the isolated and partial phenomena elicited in laboratories and complex human behaviour as observed and experienced in everyday life. The arguments offered by Zubin and Cromwell are, as yet, the embodiment of hopes that such links will be established. Confronting all studies in this tradition is the epistemological gap between information processing and the social events which constitute insanity ascription (Coulter, 1973).

The last word must be allowed Cromwell, to acknowledge his work and the inspiration he provided for this study:

> "the story of schizophrenia research has been one of often travelling down blind alleys. We are yet to know if attention and information processing deficits will prove to be an avenue" (1979, p.331).

APPENDIX A, I - PHILLIPS PREMORBID SCALE AND ULLMANN-GIOVANNONI SELF-REPORT SCORES I A RESIDENT GROUP OF SCHIZOPHRENIC PATIENTS (N = 46)

SUBJECT	PHILLIPS PREMORBID SCALE		ULLMANN-GIOVANNONI
	RATER 1	RATER 2	
1	21	17	13
2	21	14	12
3	12	11	18
4	8	7	12
5	20	24	8
6	9	9	15
7	12	15	14
8	18	13	14
9	5	7	21
10	8	11	12
11	9	12	14
12	16	20	11
13	13	16	11
14	21	24	4
15	26	29	2
16	7	9	12
17	16	16	12
18	27	26	7
19	9	9	16
20	21	23	6
21	16	14	9
22	16	18	15
23	8	12	16
24	8	9	13
25	9	8	15
26	15	13	7
27	16	14	9
28	21	18	8
29	21	17	7
30	26	24	4
31	23	21	8
32	23	22	12
33	29	29	3
34	6	4	20
35	22	23	10
36	16	12	12
37	14	13	13
38	29	29	5
39	23	19	12
40	17	15	12
41	13	12	18
42	19	17	15
43	5	6	19
44	18	16	8
45	10	10	21
46			

APPENDIX A, II - SUBJECT CHARACTERISTICS - CHRONIC SCHIZOPHRENIC GROUP

SUBJECT	AGE	NUMBER OF YEARS OF EDUCATION	MARITAL STATUS	AGE AT FIRST HOSPITALIZATION	TOTAL NUMBER OF MONTHS OF PREVIOUS HOSPITALIZATION	TOTAL NUMBER OF ADMISSIONS	PRECIPITATING FACTORS	FAMILY HISTORY OF PSYCHIATRIC DISORDER	I.Q.	CONFUSION ON FIRST ADMISSION	PARANOID DIAGNOSIS	ULLMANN SCORE	NUMBER OF MONTHS OF INDEX HOSPITALIZATION ON TWO YEAR FOLLOW-UP
1	33	11	S	30	32	2	No	No	96	No	Yes	13	63 *
2	36	15	S	27	47	4	No	Yes	130	Yes	Yes	12	36
3	28	12	M	16	11	2	No	No	138	No	No	18	26
4	24	12	S	19	33	2	Yes	No	85	Yes	No	12	46
5	30	12	S	24	71	1	No	No	97	No	No	8	38 *
6	35	10	M	20	54	2	Yes	Yes	109	Yes	Yes	15	56
7	34	10	S	16	27	7	No	Yes	107	No	No	14	8
8	25	14	S	23	18	3	No	No	120	No	No	14	39 *
9	31	8	M	26	6	4	No	No	81	No	Yes	21	2
10	25	15	S	25	6	1	No	No	114	Yes	No	14	39 *
11	20	9	S	17	15	5	No	Yes	94	Yes	No	11	67
12	36	9	S	24	69	5	No	Yes	80	Yes	Yes	11	72
13	28	11	S	17	16	2	No	No	103	No	Yes	4	10
14	36	9	S	25	108	3	No	Yes	80	No	No	2	51 *
15	40	10	M	31	106	2	No	No	85	No	Yes	12	46 *
16	34	11	S	21	63	3	No	No	90	No	No	12	60 *
17	39	9	S	26	113	4	No	No	85	No	No	7	39 *
18	40	12	M	38	20	2	Yes	No	104	No	Yes	16	39 *
19	41	12	S	27	5	4	Yes	Yes	109	No	Yes	15	3
20	38	13	M	35	12	3	Yes	No	111	No	Yes	16	1
21	39	15	M	31	32	6	No	No	115	No	Yes	13	55 *
22	33	12	M	25	35	5	No	Yes	108	Yes	No	15	3
23	29	14	S	23	38	3	Yes	Yes	125	No	No	7	38
24	20	9	S	18	27	1	Yes	No	89	No	No	9	56 *
25	41	10	S	24	203	2	No	No	86	Yes	No	8	238 *
26	27	12	S	22	52	5	No	No	115	No	No	7	25
27	37	8	S	30	70	2	No	No	90	No	Yes	4	92 *
28	44	8	S	35	66	4	No	No	85	No	Yes	8	35
29	44	9	S	18	223	2	No	Yes	87	No	No	12	247 *
30	30	11	S	23	69	3	No	No	104	No	No	3	53 *
31	22	10	S	20	4	2	No	Yes	90	No	No	10	2
32	36	18	S	20	71	6	No	Yes	110	No	Yes	13	2
33	31	13	S	21	41	3	No	Yes	92	No	No	5	29
34	28	12	S	23	13	3	No	No	98	No	No	12	30
35	28	13	S	24	14	5	No	Yes	108	Yes	Yes	12	2,5
36	27	10	M	18	5	2	Yes	?	94	No	Yes	18	0,5
37	23	9	M	21	4	2	No	No	87	Yes	No	19	0,5
38	19	10	S	18	10	2	No	Yes	90	Yes	No	8	7
39	38	9	M	23	10	5	No	No	83	Yes	Yes	21	10
40	27	9	S	23	9	4	No	No	85	No	No	7	3,5

* Patient still hospitalized at the time of the follow-up

APPENDIX A, III - SUBJECT CHARACTERISTICS - OUTPATIENT SCHIZOPHRENIC GROUP

SUBJECT	AGE	NUMBER OF YEARS OF EDUCATION	MARITAL STATUS	AGE AT FIRST HOSPITALIZATION	TOTAL NUMBER OF MONTHS OF PREVIOUS HOSPITALIZATION	TOTAL NUMBER OF ADMISSIONS	PRECIPITATING FACTORS	FAMILY HISTORY OF PSYCHIATRIC DISORDER	I.Q.	CONFUSION ON FIRST ADMISSION	PARANOID DIAGNOSIS	ULLMANN SCORE	* ADJUSTMENT RATING
1	32	8	M	26	5,5	4	No	No	81	No	Yes	22	1
2	28	12	S	19	6	1	No	Yes	98	Yes	No	9	2
3	24	14	S	21	3,5	3	Yes	No	112	Yes	No	14	1
4	45	14	S	28	34	7	No	No	86	No	Yes	14	3
5	28	14	S	25	6,5	2	Yes	No	120	No	Yes	13	3
6	22	14	S	17	9,5	5	Yes	No	110	Yes	Yes	15	3
7	32	12	S	17	43	7	No	Yes	95	Yes	No	13	3
8	30	10	S	27	8	2	No	Yes	98	No	No	13	3
9	43	10	S	18	19	3	No	No	87	No	No	9	3
10	38	10	M	38	4	1	No	Yes	97	No	No	17	1
11	33	9	S	20	42	3	Yes	No	84	No	No	8	3
12	20	12	S	18	2	2	No	Yes	118	No	No	5	3
13	30	11	S	16	15	6	No	Yes	103	No	Yes	14	1
14	31	12	M	19	33	8	No	No	108	No	Yes	18	1
15	29	11	S	16	19	3	No	No	103	No	Yes	6	3
16	21	11	S	18	9	4	No	No	98	No	No	10	1
17	23	9	S	-	-	-	No	Yes	85	No	No	4	3
18	22	12	S	16	10	3	Yes	No	110	No	No	14	1
19	25	10	M	-	-	-	No	No	88	No	No	13	3
20	32	12	S	22	7	3	No	No	95	No	No	14	2
21	26	11	S	20	9	2	No	No	97	No	No	12	1
22	21	13	S	20	2	1	No	No	97	No	No	9	1
23	44	9	M	37	64	2	No	No	96	No	No	11	2
24	30	13	S	21	16	4	Yes	No	111	No	No	12	1
25	27	13	S	-	-	-	No	Yes	103	No	Yes	9	1
26	22	10	M	21	3	1	Yes	No	114	No	Yes	17	1
27	21	11	S	18	6	2	No	No	98	No	No	10	3
28	23	10	S	20	5	2	No	Yes	90	No	No	10	2
29	19	11	S	18	3	1	No	No	106	No	Yes	12	3
30	26	9	S	23	22	4	Yes	Yes	80	Yes	Yes	10	3
31	28	10	M	18	6	3	Yes	No	90	No	Yes	18	1
32	37	12	S	36	2	2	No	No	115	Yes	No	15	2
33	24	11	M	20	4,5	3	No	No	100	Yes	No	19	1
34	33	10	M	18	14	4	No	No	91	No	No	15	1
35	32	9	M	23	5	3	No	No	93	No	Yes	21	1
36	26	12	S	18	9	2	No	Yes	94	Yes	No	9	3
37	26	12	S	21	6	3	No	No	110	Yes	No	14	1
38	40	10	S	25	11	3	No	No	82	No	Yes	14	3
39	29	12	S	21	15	2	No	No	116	No	Yes	15	3
40	24	14	S	17	25	4	No	No	110	Yes	Yes	16	2

* Adjustment rating:

1 - refers to a patient who was employed in the job category for which he was trained
2 - refers to a patient who was employed in a lower level job or by sheltered employment
3 - refers to a patient who

APPENDIX A, IV - SUBJECT CHARACTERISTICS - ACUTE SCHIZOPHRENIC GROUP

SUBJECT	AGE	NUMBER OF YEARS OF EDUCATION	MARRIAGE	AGE AT FIRST HOSPITALIZATION	TOTAL NUMBER OF MONTHS OF PREVIOUS HOSPITALIZATION	TOTAL NUMBER OF ADMISSIONS	PRECIPITATING FACTORS	FAMILY HISTORY OF PSYCHIATRIC DISORDER	I.Q.	CONFUSION ON FIRST ADMISSION	PARANOID DIAGNOSIS	ULLMANN SCORE	NUMBER OF MONTHS OF INDEX HOSPITALIZATION ON 18 MONTH
1	22	10	M	22	-	-	No	No	114	No	Yes	20	3
2	20	11	S	20	2,5	1	Yes	No	98	No	Yes	12	3
3	22	10	S	20	4	1	No	Yes	90	No	No	11	2
4	18	11	S	18	-	-	No	No	106	No	Yes	12	0,5
5	25	9	S	23	16	3	Yes	Yes	80	Yes	Yes	10	18 *
6	27	10	M	19	5	2	Yes	?	90	No	Yes	18	0,5
7	36	12	S	36	1	1	No	No	115	Yes	No	15	1
8	23	11	M	21	4	2	No	No	100	Yes	No	19	0,5
9	32	11	M	17	13	4	No	No	90	No	No	15	0,75
10	18	9	S	16	6	3	No	No	85	No	No	10	18 *
11	21	8	S	20	3	1	No	No	85	No	No	12	5
12	28	14	S	24	15	4	Yes	No	110	Yes	Yes	16	2,25
13	29	8	S	29	-	-	No	No	104	Yes	No	16	1,25
14	27	12	S	19	49	10	No	No	110	No	No	7	18 *
15	21	11	S	17	15	4	No	No	97	No	No	9	18 *
16	20	10	S	20	-	-	No	No	91	No	No	8	0,75
17	25	12	S	22	1,5	3	No	No	115	No	No	11	2,75
18	19	9	S	19	-	-	No	Yes	104	No	No	12	1
19	42	12	M	32	4	5	No	No	106	No	No	21	2
20	35	8	M	34	1	1	Yes	No	80	No	No	15	1,5
21	19	10	S	19	-	-	No	No	103	No	No	11	1
22	24	15	S	22	7	5	Yes	Yes	124	No	Yes	15	18 *
23	24	13	S	24	-	-	No	No	109	Yes	No	8	4,25
24	27	10	S	16	32	6	No	No	86	No	Yes	14	0,5
25	28	11	S	28	3	1	No	No	82	No	No	9	18 *
26	41	12	M	41	-	-	Yes	No	109	No	No	22	0,75
27	20	11	S	19	12	4	Yes	No	95	No	No	13	1,5
28	20	12	S	19	0,5	1	No	Yes	118	No	No	6	3,25
29	33	9	M	17	6	6	No	No	91	No	No	12	8,25
30	40	10	M	40	0,25	1	No	Yes	105	Yes	No	11	1,5
31	22	11	M	22	-	-	Yes	No	113	No	Yes	21	2,75
32	18	12	S	16	1	1	No	No	106	No	Yes	9	0,75
33	26	11	M	15	5	2	Yes	No	86	No	Yes	16	1,25
34	29	13	S	22	13	4	Yes	No	110	Yes	Yes	16	2,25
35	29	10	S	29	-	-	No	No	97	Yes	No	17	1,25
36	28	12	S	19	32	6	No	No	110	No	No	7	12,5
37	22	10	S	17	14	3	No	No	94	No	No	9	14
38	20	10	S	20	-	-	No	No	91	No	No	8	0,75
39	27	12	S	23	2	2	No	No	107	No	No	11	1
40	18	10	S	18	-	-	No	Yes	101	No	No	12	2,25

* Patient still hospitalized at the time of the follow-up

APPENDIX A, V - SUBJECT CHARACTERISTICS - ACUTE NONSCHIZOPHRENIC PSYCHIATRIC CONTROL GROU

SUBJECT	AGE	NUMBER OF YEARS OF EDUCATION	MARITAL STATUS	AGE AT FIRST HOSPITALIZATION	TOTAL NUMBER OF MONTHS OF PREVIOUS HOSPITALIZATION	TOTAL NUMBER OF ADMISSIONS	PRECIPITATING FACTORS	FAMILY HISTORY OF PSYCHIATRIC DISORDER	I.Q.	CONFUSION ON FIRST ADMISSION	ULIMANN SCORE	NUMBER OF MONTHS OF INDEX HOSPITALIZATION ON 18 MONTH FOLLOW-UP
1	27	10	M	27	-	-	No	No	97	No	18	18 *
2	29	12	M	28	2,5	3	Yes	Yes	110	No	18	1
3	38	9	M	38	-	-	No	Yes	88	No	17	0,75
4	26	15	S	26	-	-	Yes	Yes	110	No	10	0,5
5	33	12	M	33	-	-	No	No	106	No	19	1
6	35	13	M	33	11	1	No	No	130	No	22	0,75
7	23	10	M	21	1	1	No	No	94	No	15	0,5
8	31	12	M	31	-	-	Yes	Yes	110	No	19	1,25
9	21	10	S	21	-	-	No	No	116	No	16	2,25
10	22	14	D	17	9	4	Yes	No	110	Yes	15	1,25
11	23	10	S	17	3	2	No	Yes	81	No	9	0,75
12	21	11	S	21	-	-	Yes	No	104	No	13	3,5
13	38	10	M	38	-	-	No	Yes	98	No	21	0,5
14	21	10	S	17	17	6	Yes	No	100	No	10	1,25
15	38	10	M	21	1	1	No	No	90	No	15	1
16	36	8	M	16	9	3	No	No	83	No	12	2,5
17	22	10	S	22	-	-	Yes	Yes	95	No	12	2,5
18	28	12	M	28	-	-	No	No	113	No	20	6,25
19	31	11	M	31	-	-	No	No	88	No	16	0,5
20	32	12	M	32	2	1	No	Yes	107	No	14	2,25
21	20	12	S	19	3	5	Yes	No	117	No	9	1,25
22	23	10	S	23	-	-	No	No	93	No	10	1,25
23	21	7	S	19	22	4	No	Yes	88	No	10	4
24	20	8	S	17	1	1	No	No	90	No	11	1
25	23	13	S	20	12	1	No	Yes	119	No	8	3,5
26	23	12	S	23	-	-	Yes	No	98	No	15	3
27	30	16	M	30	-	-	Yes	Yes	102	Yes	17	3
28	39	12	M	33	7	6	Yes	Yes	106	No	19	2,5
29	37	14	S	22	2	3	Yes	No	110	No	10	1,75
30	28	13	M	28	0,5	1	No	Yes	93	No	14	2
31	23	11	S	16	3	2	No	No	82	No	10	0,75
32	26	14	S	26	-	-	No	Yes	108	No	9	1
33	26	11	M	26	-	-	Yes	Yes	115	No	15	0,75
34	24	10	S	17	4	2	No	Yes	80	No	9	0,75
35	22	11	S	22	-	-	Yes	No	107	No	13	3,5
36	36	10	M	36	-	-	No	Yes	110	No	22	0,5
37	20	10	S	16	14	4	Yes	No	98	No	10	1,25
38	39	10	S	21	1	1	No	No	90	No	15	1
39	37	9	M	19	3	1	No	No	86	No	11	2,5
40	21	14	S	17	8	3	No	No	110	Yes	15	1,25

* Patient still hospitalized at the time of the follow-up

APPENDIX A, VI - SUBJECT CHARACTERISTICS - NORMAL CONTROL GROUP

Subject	Age	Number of Years of Education	Marriage	I.Q.
1	28	15	M	95
2	29	12	S	93
3	23	12	M	108
4	30	10	M	98
5	34	11	M	110
6	38	10	M	103
7	21	12	S	113
8	29	12	M	122
9	45	10	M	106
10	24	12	M	103
11	25	12	M	97
12	21	12	S	112
13	21	12	S	98
14	19	12	S	94
15	34	12	M	125
16	40	10	M	96
17	26	12	S	107
18	22	12	S	110
19	27	12	M	100
20	29	12	M	101
21	31	10	M	109
22	30	12	M	98
23	35	10	M	115
24	22	11	S	129
25	26	12	M	104
26	37	11	S	103
27	38	10	M	100
28	30	16	S	109
29	21	12	S	119
30	32	12	S	94
31	20	13	S	105
32	19	14	S	112
33	28	12	M	107
34	31	15	M	98
35	24	11	S	106
36	26	12	M	116
37	29	14	M	114
38	28	12	M	99
39	23	12	M	102
40	19	12	S	110

APPENDIX A, VII - SYMPTOM CHARACTERISTICS OF ACUTE SCHIZOPHRENIC AND ACUTE NONSCHIZOPHRENIC PSYCHIATRIC PATIENTS

No.	Symptoms	Acute Nonschizophrenic Psychiatrics (n = 40)	Acute Schizophrenics (n = 40)
1 *+	Restricted affect	7	24
2	Preoccupied, inattentive	7	15
3 *+	Poor insight	5	37
4	Denies delusions though present	1	14
5 *+	Thoughts aloud	0	12
6	Auditory hallucinations	7	15
7 *-	Waking early	15	2
8	Apathy	7	16
9 *-	Depressed facies	17	8
10	Stereotypic	0	3
11 *-	Elation	0	5
12 *+	Widespread delusions	0	12
13	Thought withdrawal	4	9
14 *+	Incoherent speech	0	2
15	Irrelevance	1	18
16 *+	Unreliable information	18	26
17 *+	Bizarre delusions	0	10
18	Neologisms	0	0
19 *+	Nihilistic delusions	0	1
20 *+	Poor rapport	1	8

APPENDIX A, VIII - SUMMARY TABLES FOR ANALYSES OF VARIANCE
CHAPTER 6 (** = p<0,01; * = p<0,05)

PAGE 73, TABLE 9 - Age, Education, I.Q.

	Source	SS	df	MS	F
Age	Between groups	832,95	4	208,24	4,89**
	Within groups	8 305,0	195	42,59	
	Total	9 137,95			
Education	— do —	27,09	4	6,78	2,12
		626,91	195	3,21	
		654,0			
I.Q.	— do —	1 318,6	4	329,65	2,28
		26 752,2	195	137,19	
		28 070,8			

PAGE 75, TABLE 10 - Previous Hospitalization Experience

	Source	SS	df	MS	F
Age at first hospitalization	Between groups	441,94	3	147,3	3,36*
	Within groups	6 833,9	156	43,81	
	Total	7 275,84			
Total number of months of previous admissions	— do —	45 426,9	3	15 142,3	21,93**
		107 698,05	156	690,37	
		153 125,0			
Total number of previous admissions	— do —	76,63	3	25,54	7,19**
		554,14	156	3,55	
		630,77			
Average length of stay per admission	— do —	8 156,1	3	2 718,7	16,08**
		26 369,5	156	169,04	
		34 525,6			

APPENDIX A, VIII (Continued ...)

PAGE 83, TABLE 13 - Previous Hospitalization Experience of Process and Reactive Schizophrenics

	Source	SS	df	MS	F
Age of Onset	Diagnostic groups	112,42	3	37,47	1,21
	Process-Reactive	575,99	1	575,99	18,54**
	Interaction	254,34	3	84,78	2,73
	Within groups	4 723,08	152	31,07	
Length of Previous Hospitalization	— do —	34 036,87	3	11 345,62	18,69**
		5 301,79	1	5 301,79	8,74**
		10 017,95	3	3 339,32	5,50**
		92 223,94	152	606,74	
Simple Main Effects of the Interaction	Chronic	15 067,49	1	15 067,49	24,83**
	Acute	0,38	1	0,38	<1
	Outpatient	99,84	1	99,84	<1
	Psychiatric Control	152,79	1	152,79	<1
Average Length of Stay	Diagnostic groups	5 876,09	3	1 958,69	13,19**
	Process-Reactive	1 412,01	1	1 412,01	9,51**
	Interaction	2 367,53	3	789,18	5,31**
	Within groups	22 571,3	152	148,49	
Simple Main Effects of the Interaction	Chronic	3 665,7	1	3 665,7	24,69**
	Acute	0,57	1	0,57	<1
	Outpatient	97,39	1	97,39	<1
	Psychiatric Control	15,69	1	15,69	<1

APPENDIX A, VIII (Continued ...)

PAGE 87, TABLE 15 - Number of Symptoms in Process and Reactive Acute Schizophrenics and Acute Psychiatric Controls

Source	SS	df	MS	F
Diagnostic groups	257,73	1	257,73	65,75**
Process-Reactive	1,37	1	1,37	< 1
Interaction	3,32	1	3,32	< 1
Within groups	297,3	76	3,92	

PAGES 89 & 91, TABLES 17 & 18 - Education and I.Q. of Process-Reactive Patients

	Source	SS	df	MS	F
I.Q.	Diagnostic groups	48,36	3	16,12	< 1
	Process-Reactive	1 542,72	1	1 542,72	10,71**
	Interaction	369,95	3	123,32	< 1
	Within groups	21 897,7	152	144,06	
Education	— do —	3,69	3	1,23	< 1
		23,89	1	23,89	6,92**
		3,69	3	1,23	< 1
		524,78	152	3,45	

APPENDIX A, VIII (Continued ...)

PAGE 100, TABLE 22 - Demographic Characteristics of Paranoid and Nonparanoid Schizophrenics

	Source	SS	df	MS	F
I.Q.	Diagnostic groups	52,9	2	26,45	< 1
	Paranoid	87,26	1	87,26	< 1
	Interaction	9,09	2	4,46	< 1
	Within groups	18 085,1	114	158,64	
Education	— do —	1,27	2	0,64	< 1
		6,0	1	6,0	1,74
		2,36	2	1,18	< 1
		393,79	114	3,45	

PAGE 101, TABLE 23 - Hospitalization Experience of Paranoid and Nonparanoid Schizophrenics

	Source	SS	df	MS	F
Age at first hospitalization	Diagnostic groups	329,24	2	164,62	3,95*
	Paranoid	6,36	1	6,36	< 1
	Interaction	377,96	2	188,98	4,53*
	Within groups	4 755,85	114	41,72	
Simple Main Effects of Interaction	Paranoid	608,12	1	608,12	14,58**
	Nonparanoid	98,54	1	98,54	2,36
Total number of months of previous hospitalization	Diagnostic groups	29 479,42	2	14 739,71	16,08**
	Paranoid	330,88	1	330,88	< 1
	Interaction	1 661,11	2	830,56	< 1
	Within groups	104 492,01	114	916,59	
Total number of previous admissions	— do —	19,63	2	9,82	2,65
		9,45	1	9,45	2,55
		3,09	2	1,55	< 1
		422,5	114	3,71	

APPENDIX A, IX - SUMMARY TABLES FOR ANALYSES OF VARIANCE CHAPTER 11 (*p<0,05; **p<0,01; ***p<0,001).

PAGE 199, TABLE 28 - State and Trait Anxiety in Schizophrenics, Psychiatric Controls and Normals

Source	SS	df	MS	F
Between S's	28 208,98	119		
A (Groups)	8 798,10	2	4 399,05	26,52**
S's within groups	19 410,88	117	165,90	
Within S's	6 425,00	120		
B (Anxiety)	58,01	1	58,01	1,11
A x B	278,02	2	139,01	2,67
B x S's within groups	6 088,97	117	52,04	

PAGE 201, TABLE 29 - Mean Recognition Scores of Schizophrenics, Psychiatric Controls and Normals

Source	SS	df	MS	F
Between S's	104,27	119		
A (Groups)	4,53	2	2,27	2,66
S's within groups	99,74	117	0,85	
Within S's	1 247,67	960		
B (Angle)	7,29	2	3,65	5,62**
A x B	5,97	4	1,49	2,29
B x S's within groups	152,41	234	0,65	
C (Noise)	559,78	2	279,89	291,55***
A x C	3,56	4	0,89	<1
C x S's within groups	225,66	234	0,96	
B x C	24,54	4	6,14	10,96***
A x B x C	6,62	8	0,83	1,48
BC x S's within groups	261,84	468	0,56	

APPENDIX A, IX (Continued ...)

PAGE 202, TABLE 30 - Mean Recognition Scores of Process and Reactive Schizophrenics

Source	SS	df	MS	F
Between S's		39		
A (Groups)	0,39	1	0,39	<1
S's within groups	9 802,82	38	257,97	
Within S's		80		
B (Noise)	459,85	2	229,93	24,78***
A x B	13,73	2	6,87	<1
B x S's within groups	705,54	76	9,28	<1

PAGE 205, FIGURES 4 & 5 - Comparison of the Combined Process and Reactive Group at Increasing Levels of Noise

Source	SS	df	MS	F
Between S's		79		
A (Groups)	0,60	1	0,60	<1
S's within groups	12 890,47	78	165,26	
Within S's		160		
B (Noise)	1 588,8	2	794,4	80,65***
A x B	36,65	2	18,33	1,65
B x S's within groups	1 537,2	156	9,85	

APPENDIX A, IX (Continued ...)

PAGE 208, TABLE 33 - Comparison of Reactive-Paranoid and Process Nonparanoid Schizophrenics at Increasing Levels of Noise

Source	SS	df	MS	F
Between S's		26		
A (Groups)	7,17	1	7,17	<1
S's within groups	4 431,49	25	177,26	
Within S's		54		
B (Noise)	164,87	2	82,44	8,67***
A x B	34,17	2	17,09	1,79
B x S's within groups	475,39	50	9,51	

PAGE 209, TABLE 34 - Comparison of Reactive-Paranoid and Process-Nonparanoid Schizophrenics at Increasing Width of Target Separation

Source	SS	df	MS	F
Between S's		26		
A (Groups)	7,17	1	7,17	<1
S's within groups	4 369,93	25	174,79	
Within S's		54		
B (Angle)	40,51	2	20,26	8,66***
A x B	16,84	2	8,42	3,59*
B x S's within groups	117,23	50	2,34	

APPENDIX A, IX (Continued ...)

PAGE 210, TABLE 35 - Comparison of Drug and Nondrug Schizophrenics and Psychiatric Controls

Source	SS	df	MS	F
	0,59	1	0,59	<1
B (Drug)	10,05	1	10,05	<1
A x B	5,91	1	5,91	<1
Within groups	974,57	76	12,82	

PAGE 212, TABLE 37 - Mean Number of Digits Available to Schizophrenics, Psychiatric Controls and Normals

Source	SS	df	MS	F
Between S's	3 628,11	119		
A (Groups)	82,08	2	41,04	1,35
S's within groups	3 546,03	117	30,31	
Within S's	5 801,08	1 320		
B (Delays)	1 039,27	11	94,48	26,32***
A x B	139,07	22	6,32	1,74
B x S's within groups	4 622,74	1 287	3,59	

APPENDIX A, IX (Continued ...)

PAGE 214, TABLE 38 - Mean Number of Digits Available to Process and Reactive Schizophrenics

Source	SS	df	MS	F
Between S's		39		
A (Groups)	22,55	1	22,55	< 1
S's within groups	37 722,01	38	992,68	
Within S's		440		
B (Delays)	495,35	11	45,03	8,81***
A x B	40,20	11	3,65	< 1
B x S's within groups	2 134,77	418	5,11	

PAGE 216, TABLE 39 - Mean Number of Digits Available to Process and Reactive Psychiatric Controls

Source	SS	df	MS	F
Between S's		39		
A (Groups)	7,88	1	7,88	< 1
S's within groups	13 257,21	38	348,87	
Within S's		440		
B (Delays)	474,79	11	43,16	9,97***
A x B	31,54	11	2,88	< 1
B x S's within groups	1 811,5	418	4,33	

APPENDIX A, IX (Continued ...)

PAGE 218, TABLE 40 - Mean Number of Digits Available to Process and Reactive Patients (Combined Groups)

Source	SS	df	MS	F
Between S's		79		
A (Groups)	44,0	1	44,0	<1
S's within groups	24 255,85	78	310,97	
Within S's		880		
B (Delays)	956,0	11	86,91	18,77***
A x B	27,2	11	2,47	<1
B x S's within groups	3 975,34	858	4,63	

PAGE 219, TABLE 41 - Mean Number of Digits Available to Paranoid and Nonparanoid Schizophrenics

Source	SS	df	MS	F
Between S's		39		
A (Groups)	30,59	1	30,59	<1
S's within groups	37 706,97	38	992,29	
Within S's		440		
B (Delays)	451,68	11	41,06	8,05***
A x B	47,91	11	4,36	<1
B x S's within groups	2 132,36	418	5,10	

APPENDIX A, IX (Continued ...)

PAGE 221, TABLE 42 - Mean Number of Digits Available to Reactive-Paranoid and Process-Nonparanoid Schizophrenics

Source	SS	df	MS	F
Between S's		26		
A (Groups)	70,69	1	70,69	<1
S's within groups	7 450,94	25	298,04	
Within S's		297		
B (Delays)	359,23	11	32,66	6,17***
A x B	47,09	11	4,28	<1
B x S's within groups	1 455,10	275	5,29	

PAGE 223, TABLE 43 - Mean Overall Scores of Drug and Nondrug Patients in the Schizophrenic and Psychiatric Control Groups

Source	SS	df	MS	F
A (Groups)	867,19	1	867,19	2,23
B (Drugs)	449,14	1	449,14	1,15
A x B	114,06	1	114,06	<1
Within groups	29 562,92	76	388,98	

APPENDIX A, IX (Continued ...)

PAGE 227, TABLE 47 - Recall of First and Second Half Sets by Schizophrenics, Psychiatric Controls and Normals

Source	SS	df	MS	F
Between S's		104		
A (Groups)	1 098,37	2	549,19	<1
S's within groups	1 379 538,3	102	13 524,89	
Within S's		105		
B (Sets)	68 196,33	1	68 196,33	76,58***
A x B	907,58	2	453,79	<1
B x S's within groups	90 834,69	102	890,54	

PAGE 228, TABLE 48 - Recall of First and Second Half Sets by Process and Reactive Schizophrenics

Source	SS	df	MS	F
Between S's		38		
A (Groups)	153,41	1	153,41	<1
S's within groups	479 448,2	37	12 958,06	
Within S's		39		
B (Sets)	27 391,88	1	27 391,88	26,96***
A x B	70,95	1	70,95	<1
B x S's within groups	37 587,21	37	1 015,87	

APPENDIX A, IX (Continued ...)

PAGE 228, TABLE 49 - Recall of First and Second Half Sets by Process and Reactive Psychiatric Controls

Source	SS	df	MS	F
Between S's		33		
A (Groups)	36,53	1	36,53	<1
S's within groups	415 691,95	32	12 990,37	
Within S's		34		
B (Sets)	26 283,03	1	26 283,03	23,96***
A x B	42,48	1	42,48	<1
B x S's within groups	35 104,39	32	1 097,01	

PAGE 229, TABLE 50 - Recall of First and Second Half Sets by Process and Reactive Patients (Combined Groups)

Source	SS	df	MS	F
Between S's		72		
A (Groups)	160,35	1	160,35	<1
S's within groups	920 565,9	71	12 965,72	
Within S's		73		
B (Sets)	55 218,48	1	55 218,48	52,82***
A x B	102,54	1	102,54	<1
B x S's within groups	74 218,16	71	1 045,33	

APPENDIX A, IX (Continued ...)

PAGE 230, TABLE 51 - Recall of First and Second Half Sets by Paranoid and Nonparanoid Schizophrenics

Source	SS	df	MS	F
Between S's		38		
A (Groups)	159,69	1	159,69	< 1
S's within groups	479 982,39	37	12 972,49	
Within S's		39		
B (Sets)	26 306,43	1	26 306,43	25,98***
A x B	178,87	1	178,87	< 1
B x S's within groups	37 453,78	37	1 012,26	

PAGE 231, TABLE 53 - Overall Level of Recall of Drug and Nondrug Schizophrenics and Psychiatric Controls

Source	SS	df	MS	F
A (Groups)	148,93	1	148,93	< 1
B (Drug)	0,19	1	0,19	< 1
A x B	1 473,95	1	1 473,95	6,95*
Error	16 118,4	76	212,08	

Main Effects of the Interaction

Source	SS	df	MS	F
A at B_1	342,78	1	342,78	1,62
A at B_2	1 280,11	1	1 280,11	6,04*
Error	16 118,4	76	212,08	

APPENDIX A, IX (Continued ...)

PAGE 232, TABLE 54 - Strategies of Recall Amongst Schizophrenics, Psychiatric Controls and Normals

Source	SS	df	MS	F
Between S's	350,66	119		
A (Groups)	0,08	2	0,04	<1
S's within groups	350,58	117	2,99	
Within S's	18 664,0	240		
B (Strategies)	4 597,69	2	2 298,85	41,52***
A x B	1 108,74	4	277,19	5,01***
B x S's within groups	12 957,57	234	55,37	

Analysis of the Simple Main Effects

Source	SS	df	MS	F
Ear Order	716,02	2	358,01	17,26***
Error	7 405,17	357	20,74	
Temporal Order	164,6	2	82,3	9,10***
Error	3 226,5	357	9,04	
Combination	228,2	2	114,1	10,76***
Error	3 785,3	357	10,6	

APPENDIX A, IX (Continued ...)

PAGE 233, TABLE 55 - Recall of Digits Presented to the Left and Right Ears

Source	SS	df	MS	F
Between S's	25 034,1	119		
A (Groups)	1 370,2	2	685,1	3,39*
S's within groups	23 663,9	117	202,26	
Within S's	29 637,9	120		
B (Ears)	8 362,9	1	8 362,9	48,77***
A x B	1 213,9	2	606,95	3,54*
B x S's within groups	20 061,1	117	171,46	

APPENDIX B, 1 - THE PHILLIPS PROGNOSTIC RATING SCALE
PART I. PRE-MORBID HISTORY

A. RECENT SEXUAL ADJUSTMENT

1. Stable heterosexual relation and marriage 0
2. Continued heterosexual relation and marriage but unable to establish home 1
3. Continued heterosexual relation and marriage broken by permanent separation 2
4. (a) Continued heterosexual relation and marriage but with low sexual drive 3
   (b) Continued heterosexual relation with deep emotional meaning but emotionally unable to develop it into marriage 3
5. (a) Casual but continued heterosexual relations, i.e., "affairs", but nothing more 4
   (b) Homosexual contacts with lack of or chronic failure in heterosexual experiences 4
6. (a) Occasional casual heterosexual or homosexual experience with no deep emotional bond 5
   (b) Solitary masturbation with no active attempt at homosexual or heterosexual experiences 5
7. No sexual interest in either men or women 6

B. SOCIAL ASPECTS OF SEXUAL LIFE DURING ADOLESCENCE AND IMMEDIATELY BEYOND

1. Always showed a healthy interest in girls with a steady girlfriend during adolescence 0
2. Started taking girls out regularly in adolescence 1
3. Always mixed closely with boys and girls 2
4. Consistent deep interest in male attachments with restricted or no interest in girls 3
5. (a) Casual male attachments with inadequate attempts at adjustment to going out with girls 4
   (b) Casual contacts with boys and girls 4

APPENDIX B, 1 (Continued ...)

6. (a) Casual contacts with boys and with lack of interest in girls 5
   (b) Occasional contacts with girls 5
7. No desire to be with boys and girls; never went out with girls 6

C. SOCIAL ASPECTS OF RECENT SEXUAL LIFE : 30 YEARS OF AGE AND ABOVE

1. Married and has children, living as a family unit 0
2. Married and has children but unable to establish or maintain a family home 1
3. Has been married and had children but permanently separated 2
4. (a) Married but considerable marital discord 3
   (b) Single, but has had engagement or deep heterosexual relationship but emotionally unable to carry it through to marriage 3
5. Single, with short engagements or relationships with women which do not appear to have had much emotional depth for both partners, i.e., "affairs" 4
6. (a) Single, has gone out with a few girls but without other indications of a continuous interest in women 5
   (b) Single, consistent deep interest in male attachments, no interest in women 5
7. (a) Single, occasional male contacts, no interest in women 6
   (b) Single, interested in neither men nor women 6

D. SOCIAL ASPECTS OF RECENT SEXUAL LIFE : BELOW 30 YEARS OF AGE

1. Married, living as a family unit, with or without children 0
2. (a) Married, with or without children, but unable to establish or maintain a family home 1

APPENDIX B, 1 (Continued ...)

2. (b) Single but engaged or in a deep heterosexual relationship (presumably leading toward marriage) 1
3. Single, has had engagement or deep heterosexual relationship but has emotionally been unable to carry it through to marriage 2
4. Single, consistent deep interest in male attachments, with restricted or lack of interest in women 3
5. Single, casual male relationships with restricted or lack of interest in women 4
6. Single, has gone out with a few girls casually but without other indications of a continuous interest in women 5
7. (a) Single, never interested in or never associated with either men or women 6
   (b) Antisocial 6

E. PERSONAL RELATIONS : HISTORY

1. Always has had a number of close friends but did not habitually play a leading role 1
2. From adolescence on had a few close friends 3
3. From adolescence on had a few casual friends 3
4. From adolescence on stopped having friends 4
5. (a) No intimate friends after childhood 5
   (b) Casual but never any deep intimate mutual friendships 5
6. Never worried about girls or boys; no desire to be with boys and girls 6

F. RECENT PREMORBID ADJUSTMENT IN PERSONAL RELATIONS

1. Habitually mixed with others but not a leader 1
2. Mixed only with a close friend or a group of friends 3

APPENDIX B, 1 (Continued ...)

3. No close friends; very few friends; had friends but was never quite accepted by them 4
4. Quiet; aloof; seclusive; preferred to be by self 5
5. Antisocial 6

APPENDIX B, 2 - BIOGRAPHICAL CHECKLIST (ULLMANN-GIOVANNONI SELF REPORT SCALE, 1964)

Please answer TRUE or FALSE to the following statements as they apply to yourself. Tick the most suitable answer.

		TRUE	FALSE
1.	I am married now	....	.....
2.	I have paid regularly to buy a house	....	.....
3.	I like to read books	....	.....
4.	I have fathered children	....	.....
5.	In my teens I was a member of a group of friends who did things together	....	.....
6.	I have made friends at the hospital	....	.....
7.	When I leave the hospital I will live with my wife	....	.....
8.	I hardly ever went over to another kid's house after school or on weekends	....	.....
9.	I have a job to do at the hospital	....	.....
10.	I have been married	....	.....
11.	Before I was seventeen I had left the home I was raised in and never went back except for visits	....	.....
12.	I like to go to some of the dances and other activities at the hospital	....	.....
13.	When I leave the hospital I will live with one or both of my parents	....	.....
14.	I finished at least one year of education after high-school - for example, trade apprenticeship	....	.....
15.	I was a good student in school	....	.....
16.	I have worked steadily at one job or for one employer for over two years	....	.....
17.	Adding up all the money I earned for the last three years, it comes to less than R700, before deductions	....	.....
18.	I have visitors at the hospital at least once a month	....	.....

APPENDIX B, 2 (Continued ...)

	TRUE	FALSE
19. When I was in school, I did'nt like Physical Education classes	....	.....
20. Alcohol has nothing to do with my difficulties	....	.....
21. I had several brothers and sisters in my home	....	.....
22. More than once in the last year I have stayed on after some group meeting and talked with some other members about something that went on	....	.....
23. My top wage in the last five years was less than R1,25 an hour	....	.....
24. Farming is a healthy occupation	....	.....
25. Shortly before I came into the hospital there was some major change in my life - such as marriage, birth of a baby, death, injury, loss of job, etc	....	.....
26. I have earned my living for longer than a year at full-time work	....	.....
27. I prefer cold weather to hot weather	....	.....
28. I have been deeply in love with someone and have told them about it	....	.....
29. In the kinds of work I do it is expected that people will stay for at least a year	....	.....
30. An automobile is a necessity in these times	....	.....
31. I have had to stay in a mental hospital for more than one year at a time	....	.....
32. In my teens I was a regular member of a club or organisation that had a grown-up who came to meetings (scouts, school club, church, youth club)	....	.....
33. Religion is important in my life	....	.....
34. Within the last five years I have spent more than half of the time in a mental hospital	....	.....
35. In my teens there was more than one girl with whom I had more than two dates	....	.....

APPENDIX B, 3 - INTERVIEW SCHEDULE (ABBREVIATED PRESENT STATE EXAMINATION, CARPENTER 1976)

NAME OF PATIENT: .....

NAME OF DOCTOR/PSYCHIATRIST: .....

Please could you direct the course of your interview with the patient so as to be able to answer either YES or NO to each of the following signs or symptoms (please tick the most appropriate answer):-

1. RESTRICTED AFFECT Blank, expressionless face. Very little or no emotion shown when delusion or normal material is discussed which would usually bring out emotion. YES NO

2. PREOCCUPIED, INATTENTIVE Preoccupied, or inattentive, or fails to understand questions YES NO

3. POOR INSIGHT YES NO

4. DENIES DELUSIONS THOUGH PRESENT Do you think the patient is denying delusions? YES NO

5. THOUGHTS ALOUD Do you ever feel your thoughts are being broadcast, transmitted, so that everyone knows what you are thinking? Do you ever seem to hear your thoughts spoken aloud (almost as if someone standing nearby could hear them)? YES NO

6. AUDITORY HALLUCINATIONS Rate the presence of auditory hallucinations YES NO

7. WAKING EARLY Have you been waking earlier in the morning and remaining awake? (Rated YES if one to three hours earlier than usual) YES NO

APPENDIX B, 3 (Continued ...)

8. APATHY Apathetic and disinterested YES NO

9. DEPRESSED FACIES Facial expression sad, depressed YES NO

10. STEREOTYPIC Frequent repetition of one or more stereotyped phrases YES NO

11. ELATION Elated, joyous mood YES NO

12. WIDESPREAD DELUSIONS Are many areas of the patient's life interpreted delusionally? YES NO

13. THOUGHT WITHDRAWAL Do you feel as if your thoughts were being taken away, so that your mind is a complete blank? YES NO

14. INCOHERENT SPEECH Free and spontaneous flow of incoherent speech YES NO

15. IRRELEVANCE Replies tangentially or irrelevantly to questions. Responds without apparent regard to the content of the question YES NO

16. UNRELIABLE INFORMATION Was the information obtained in this interview credible? YES NO

17. BIZARRE DELUSIONS Are the delusions comprehensible? Are the delusions realistically possible? YES NO

18. NEOLOGISMS Patient makes up words that have no generally accepted meaning YES NO

APPENDIX B, 3 (Continued)

19. NIHILISTIC DELUSIONS Do you feel that your body is decaying, rotting? Do you feel that some part of your body is missing, for example, head, brain or arms? Do you ever have the feeling that you do not exist, that you are dead, dissolved? YES NO

20. POOR RAPPORT Did the interviewer find it impossible to establish good rapport with the patient during the interview? YES NO

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