THE PREDICTION OF SHORT TERM ADJUSTMENT
IN PSYCHOTIC PATIENTS

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ABSTRACT

Progress in schizophrenia research has been hindered by the limitations of contemporary diagnostic criteria. All widely used diagnostic systems allow considerable variability in symptoms between schizophrenics and much similarity across psychotic disorders. Furthermore, schizophrenics show large differences in response to treatment strategies and in prognosis. These facts have led to a growing consensus that schizophrenia is not a homogeneous disorder but represents a heterogeneous collection of disorders. In the face of this heterogeneity, most schizophrenia research is conducted by comparing a group of diagnosed schizophrenics with a control group. This approach carries with it the implicit assumption that the disorder is homogeneous. The variability between schizophrenics and similarities across various psychotic disorders in association with this research strategy probably contributes to the slow progress in schizophrenia research. An alternative, three-point research strategy was proposed: 1) All psychotic patients, without diagnosed organic disorders, should be included in research studies to compensate for the imprecision in contemporary diagnostic procedures, 2) multiple measures should be used to identify variables that cluster within subgroups of patients, and 3) any identified subcategory of schizophrenia should be evaluated with regard to how well it predicts response to treatment and prognosis. In the present study, premorbid adjustment, negative symptoms (e.g., flat affect), and smooth pursuit eye movement anomalies were used to predict rehospitalization, general level of adjustment at follow-up, and employment-heterosexual
period was nine to 18 months. Thirty-seven patients who had recently experienced their first psychotic episode served as subjects. Twenty were diagnosed schizophreniform, nine unipolar depressed, six bipolar, and two paranoid. The results of this study were successful in identifying two subgroups of psychotic patients. Disrupted eye-tracking, poor premorbid adjustment and a preponderance of negative symptoms tended to cluster in individuals with poor general and employment-heterosexual adjustment while good eye-tracking, normal premorbid adjustment, and a relative absence of negative symptoms were common in individuals with good adjustment at follow-up. Rehospitalization was not predicted successfully. The results are discussed in terms of their implications for a neuropathological subtype of schizophrenia. Suggestions for further research to extend the present findings are offered.
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INTRODUCTION

Problems in Schizophrenia Research

Limitations of Current Diagnostic Systems

The enormous quantity of research that has been devoted to trying to understand schizophrenia results, in part, from the intractable nature of the problem. However, the limitations of contemporary methods in schizophrenia research have resulted in less progress than might otherwise have been hoped for. These limitations arise from two sources: (1) Contemporary diagnostic criteria, and (2) the implicit assumption that schizophrenia is a homogeneous disorder.

The Problem of Overinclusion

Ideally, diagnoses are based on the interrelationship or clustering among elements within a diagnostic category and the degree of non-relationship or independence between elements across categories. Once made, a diagnosis should have implications for treatment decisions and outcome predictions for individuals who fall within a particular diagnostic category (World Health Organization, 1979).

With the advent of DSM III, the diagnosis of schizophrenia is more reliable than ever before (American Psychiatric Association, 1980). The symptom categories that define schizophrenia, under every commonly used diagnostic system, are based on the course and presenting state as defined by the patient's verbal report of subjective experiences and behavioral observations made by others. In addition to the symptom categories that cluster in diagnosed schizophrenics, there are criteria that are used to define nonrelationships between individuals in other diagnostic categories and schizophrenics. DSM III, for example, excludes those individuals who develop an affective syndrome before
schizophrenia or who are found to have an organic mental disorder coincident with schizophrenic symptoms. It should be added, however, that DSM III allows the possibility of an individual who is diagnosed schizophrenic to have a superimposed organic mental disorder (American Psychiatric Association, 1980). Any exclusionary diagnosis comprises a set of symptoms which together define an alternative symptom complex. For example, an individual may present with florid psychotic symptoms, but, if, after medical examination, a number of symptoms congruent with the symptom complex of cerebral trauma are found, then the diagnosis will be cerebral trauma. The psychotic symptoms in this case are ancillary.

Even with the improved reliability introduced by DSM III, there remain some serious problems. As was noted above, any diagnosis is based, in part, on the interrelationship or clustering among elements within a diagnostic category. Substantial individual differences have been observed over a number of behavioral and biological dimensions across diagnosed schizophrenics (for a review of variables putatively related to schizophrenia see Baldessarini, 1977; Hailer, 1980; Houlihan, 1977; Perris, Struwe, & Jansson, 1981). These differences, for the most part, are not incorporated into any alternative diagnosis. If additional anomalies that occur with the schizophrenic symptoms do not combine to form an alternative diagnosis, then schizophrenia is diagnosed and the additional anomalies are regarded as ancillary. By limiting diagnosis to the presently used psychotic symptoms, as reported by the individual, and self-care ability, as observed by others, researchers may be overlooking numerous potentially useful variables.
The additional variables, if they were incorporated into the schizophrenia symptom complex, would be useful in defining schizophrenia more precisely and, thus, in helping to better understand the disorder. A more precise (i.e. more inclusive) diagnostic scheme would probably lead to a better defined, more homogeneous population of patients.

In addition to the interrelationship or co-occurrence among elements, it was noted above that any diagnosis involves nonrelationship or independence between elements across diagnostic classes. There are numerous disorders that present with psychotic symptoms that are indistinguishable from those found in diagnosed schizophrenics. Affective disorders, for example, are defined such that it is frequently difficult to specify whether an individual has schizophrenia or an affective disorder (American Psychiatric Association, 1980). This decision is made on the basis of which symptoms occurred first and/or which symptoms are prominent. Unless a particular patient presents himself at the first sign of any symptoms, the decision as to which symptoms occurred first is frequently difficult to make. The decision regarding which symptoms are prominent is confused by the symptom overlap between the two diagnostic categories and by the prevalence of depression in diagnosed schizophrenics (American Psychiatric Association, 1980). There are also a number of organic disorders that may present with psychotic symptoms that are indistinguishable from those found in schizophrenia (Davidson & Bagley, 1969). Thus, the symptom overlap between the diagnosis of schizophrenia and numerous other diagnoses frequently makes it difficult to demonstrate nonrelationship or independence between
elements across diagnostic classes. For the purposes of the present
discussion, the term psychotic will refer to psychiatric disorders that
present with psychotic symptoms (i.e., delusions and hallucinations) but
that have no diagnosed organic correlates (e.g., epilepsy, cerebral
trauma). The fact that schizophrenia, as it is presently defined, is
frequently very difficult to distinguish from some other disorders,
indicates that the schizophrenia symptom complex is inadequate. As was
noted above, more variables must be incorporated into the symptom
complex in order to derive a more inclusive diagnostic scheme and, thus,
to define a more homogeneous population of patients. A more precise
diagnostic scheme would make it possible to distinguish between dis­
orders more consistently than is possible with contemporary diagnostic
systems.

Finally, it was stated above that a diagnosis should have implica­
tions for treatment decisions and outcome predictions for individuals
who fall within the diagnostic category. There is a great deal of
evidence indicating that there are large individual differences between
diagnosed schizophrenics both in response to any treatment strategy and
in prognosis (for a review, see Clare, 1976; Cryder, 1979; Hailer, 1980;
Houlihan, 1977; Neale & Oltmanns, 1980). Considering the variability
across diagnosed schizophrenics and the overlap between diagnostic cate­
gories that were noted above, it is not surprising that large individual
differences are observed in outcome. These diagnostic limitations are
central to the second problem in schizophrenia research.

The Problem of Heterogeneity

By using a prescribed diagnostic method to define a disorder, the
diagnostic category is implicitly assumed to describe a population that is homogeneous with regard to the disorder. Research protocol dictates that the effects of one manipulation on a homogeneous clinical population be compared with the effects on a homogeneous control group. Any observed differences on dependent measures support the hypothesis that the populations from which the groups were derived, as determined by the diagnostic procedure used, are different with regard to the manipulation made. However, if the diagnostic procedure allows much variability within the disorder, much similarity across disorders, and is associated with variability in prognosis, then the only clear relationship that can be claimed is between the population of diagnosed patients and the construct that the diagnostic procedure purportedly measures. This is the case with schizophrenia. Without a more comprehensive definition of this diagnostic class, the individual differences within the disorder and similarities across disorders will continue to hinder research progress. In practice, the variability that is observed within the population of diagnosed schizophrenics tends to be minimized in favor of the diagnostic similarities. Thus, while schizophrenics have been shown to vary widely with regard to numerous variables, group differences are hypothesized based on the homogeneity assumption. This research approach persists despite the fact that there is an emerging consensus that schizophrenia may not be a unitary disorder but rather is a heterogeneous group of disorders with similar presenting symptoms (Baldessarini, 1977; Hailer, 1980; Houlihan, 1977; Jeste, Kleinman, Potkin, Luchins, & Weinberger, 1982; Kety, 1980). Some of the
dimensions along which diagnosed schizophrenics have been shown to vary must be incorporated into the diagnostic system if this heterogenous group is to be more specifically defined into homogeneous subgroups.

In addition to studying individuals within the schizophrenic diagnosis, individuals with psychiatric diagnoses that overlap with schizophrenia also need to be considered. As was noted above, a number of anomalies are observed both within some schizophrenics and within some nonschizophrenic psychiatric patients. These variables are frequently not incorporated into the schizophrenic symptom complex nor into any alternative diagnosis. If a number of these variables were systematically studied in combination over heterogeneous groups of psychotic patients, investigators could define subgroups more specifically using those variables that co-occur within subgroups and show independence between subgroups. The isolation of homogeneous subgroups using a number of variables would be the first step towards making specific predictions for individuals over such measures as response to treatment or prognosis. This could also lead to the development of more specific treatment strategies.

Summary of Problems in Schizophrenia Research

Progress in schizophrenia research has been hindered by the limitations of contemporary diagnostic criteria. All widely used diagnostic systems allow much variability between schizophrenics and much similarity across psychotic disorders. Furthermore, large differences are observed in response to treatment strategies and in prognosis between diagnosed schizophrenics. These facts have led to a growing consensus
that schizophrenia is not a homogeneous disorder but represents a heterogeneous collection of disorders. In the face of this heterogeneity, most schizophrenia research is conducted by comparing a group of diagnosed schizophrenics with a control group. This approach carries with it the implicit assumption that the disorder defined by the diagnostic method is homogeneous. The variability between schizophrenics and similarities across various psychotic disorders, in association with this research strategy probably contributes to the slow progress in schizophrenia research. A more profitable approach might be to incorporate schizophrenic patients and nonschizophrenic psychotic patients (without diagnosed organic brain damage) into a single research strategy aimed at defining this heterogeneous group of disorders more precisely. The psychoses must be defined by a number of variables, in addition to the presently used criteria, in order to isolate homogeneous subgroups. This could be the first step towards making specific predictions for psychotic individuals over response to various treatment strategies and for prognosis.
Objectives of the Present Research

The previous observations can be used to generate three recommendations for schizophrenia research: (1) Until a narrower, more inclusive symptom complex is found, research should include all psychotic patients, excluding those with diagnosed organic disorders, regardless of the psychiatric diagnosis made; (2) a multidimensional approach should be used in order to derive subgroups of individuals who show interrelationship over a number of variables and to demonstrate independence between subgroups of psychotic individuals, and; (3) the utility of any identified categories should be evaluated with regard to how well they predict response to treatment strategies and prognosis. Necessarily, this research involves numerous studies designed to isolate groups of variables that can be used to define meaningful subgroups of psychotic patients, to replicate findings, to extend findings to incorporate more defining variables, and to test the predictive value of identified subgroups of patients by demonstrating a relationship between the subgrouping and outcome variables.

This thesis represents an attempt to isolate a homogeneous subgroup of psychotic patients by using a number of variables and by following the above recommendations. A nine to 18 month follow-up will be used to evaluate the predictive utility of any categories that are isolated. The selection of variables has been made so as to provide the basis for further research. Further studies will be conducted based on the results from the present thesis.

Rationale

The notion that there are distinct subtypes within the schizophrenia-
nia diagnosis is not new. Numerous distinctions have been made during the history of schizophrenia research (for a review see Neale & Oltmanns, 1980). Kraepelin coined the term dementia praecox to define a disorder with early onset and progressive intellectual deterioration. This classification contained paranoid, catatonic, hebephrenic, and simple sub-types (Neale & Oltmanns, 1980). A further subtype that presented with acute onset followed by rapid recovery was described by Kasanin (1933). It was termed "schizoaffective" disorder and, as the name implies, includes individuals who present with both schizophrenic and affective symptoms.

More recently a distinction was made between process and reactive schizophrenia (Garmezy & Rodnick, 1959). Process schizophrenics are defined by poor premorbid status and poor prognosis. This distinction resembles Kraepelin's dementia praecox with early onset and deteriorating course. Reactive schizophrenics, on the other hand, usually have normal premorbid adjustment, rapid onset, and relatively good prognosis (Garmezy & Rodnick, 1959). Recent work by Crow (1980, Johnstone, Crow, Frith, Carney, & Price, 1978) and Weinberger (Weinberger, Cannon-Spoor, & Potkin, 1980a; Weinberger, DeLisi, Perman, Targum, & Wyatt, 1982) has stimulated renewed interest in the process classification. It has been hypothesized that patients with poor prognosis have few florid psychotic symptoms with relatively more negative symptoms (flat affect, poverty of speech and lack of drive; Johnstone et al., 1978), poor response to neuroleptics (Weinberger, Bigelow, & Kleinman, 1980b), signs of neuropathology (Weinberger et al., 1982) and poor premorbid status (Weinberger et al., 1980a). Other measures that are putatively related
To poor prognosis in schizophrenics include deviant smooth pursuit eye movements (Holzman, Proctor, & Hughes, 1973), poor heterosexual adjustment (Kokes, Strauss, & Klorman, 1977), and low scores on neuropsychological tests (Donnelly, Weinberger, Waldman, & Wyatt, 1980). These measures have not been integrated into any contemporary diagnosis of schizophrenia. Measures of premorbid status, negative symptoms, and eye movements will be investigated in the present study. Each of these measures will be discussed further below.

Most studies that have investigated poor prognosis in schizophrenia have used groups of chronically ill, often hospitalized, patients (Neale & Oltmanns, 1980). With this strategy, findings may be influenced by extended periods of hospitalization, long term medication, or the process of having a disorder for a long period of time. Furthermore, historical data are frequently difficult to obtain or are unreliable for these patients (Neale & Oltmanns, 1980). In order to reduce the influence from these sources, only patients who have experienced their first psychotic episode up to three months before entering this study were used. Finally, by using patients who have recently suffered their first psychotic episode, the probability of obtaining a group that is homogeneous with regard to the starting point of the disorder is increased. Level of adjustment achieved at the end of the follow up period (determined from the Global Assessment Scale), the number of psychiatric rehospitalizations in the nine months after the first psychotic episode, and employment-heterosexual adjustment achieved during the follow-up period were used to assess the short term course of the disorder.
In summary, limitations in schizophrenia research were used to generate three recommendations for further research: (1) All psychotic patients who have no diagnosed organic disorder should be selected for study; (2) A multidimensional approach should be used to identify homogeneous subgroups; (3) Any identified subclassification should be evaluated with regard to its predictive utility. This thesis represents the first in a series of studies aimed at isolating homogeneous subgroups and following the recommendations made above. One enduring distinction that has prevailed throughout the history of schizophrenia research is that of poor prognosis (dementing or process) schizophrenia. Numerous variables have been studied in relation to process schizophrenia but are not used in the diagnosis of schizophrenia. Measures of premorbid status, negative symptoms, and eye movement anomalies are among the putative predictors of poor prognosis. These measures will be used in the present study in an attempt to isolate subgroups of patients who show poor outcome nine to 18 months after their first psychotic episode.

Justification for Choice of Dependent Measures

Premorbid Adjustment

In a review of the literature, Kokes, Strauss, and Klorman (1977) concluded that while much progress has been made, the available measures of premorbid status are inadequate. No single variable adequately defines the essential aspects of prognosis since both premorbid status and prognosis are multidimensional. Also, social variables significantly affect outcome. Various premorbid measures that are presently used differentially predict specific types of outcome and are thus, not comparable. Furthermore, studies that use the same measures frequently
use different cutoff scores to isolate groups based on good or poor premorbid history. This has resulted in confusing findings that are difficult to interpret and often contradictory (Kokes et al., 1977; Klorman, Strauss, & Kokes, 1977). Nevertheless, historical information concerning premorbid adjustment has proved to be the most powerful predictor of outcome in schizophrenia (Neale & Oltmanns, 1980). The Phillips Premorbid History scale (PMH) has been accepted as a reliable and valid measure of premorbid adjustment and has widespread use (Kokes et al., 1977). A long form of the scale was developed by Phillips (1953). This measure was found to be significantly related to percent of lifetime spent in psychiatric hospitals ($r = .42$ to $.45$; DeWolfe, 1968) and duration of hospitalization in a three year follow-up period ($r = .38$; Cancro & Sugerman, 1968). In another study (Schnell, 1964) the PMH was found to be related to social-heterosexual adjustment. The validity of the PMH was questioned by Strauss and Carpenter (1974, 1977) who found no relationship between this measure and duration of hospitalization, poor social relations, unemployment, or symptoms at a two year follow-up. Kokes et al. (1977) suggest that these results indicate that the PMH may have predictive validity only for specific types of outcome. A shortened version of the PMH has been devised by Harris (1975). This scale has been shown to have high reliability ($r = \text{mid .80s to mid .90s}$) and high concurrent validity with the PMH ($r = .95$ for males and $.85$ for females; Kokes et al., 1977). Because of the relatively good properties of this scale, the shortened version of the PMH will be used in this study as a measure of premorbid adjustment.
Negative Symptoms

A series of studies by Crow and his co-workers have examined negative symptoms (flat affect, poverty of speech, and lack of drive) in schizophrenics (Crow, 1978; 1980; 1981; Crow, et al., 1982). Johnstone et al. (1978) found a positive relationship between negative symptoms and poor prognosis. Other studies have indicated that negative symptoms may reflect neurological anomalies (Crow, 1981), decreased dopamine receptor levels (Crow, 1978), poor response to neuroleptics (Owens, Johnstone & Frith, 1982), intellectual impairment (Crow et al., 1981), and temporal disorientation (Crow et al., 1981). Furthermore, while florid symptoms (hallucinations and delusions) tend to improve with treatment, negative symptoms tend to be more refractory and ultimately more crippling (Andreasen & Olsen, 1982). On the basis of these findings Crow (1980) postulated that the form of schizophrenia characterized by negative symptoms may be related to the dementias. These findings suggest that negative symptoms may be useful in defining a homogeneous subgroup of psychotic patients that is associated with poor clinical outcome.

Andreasen (1982) reviewed the literature on positive-negative symptomatology and noted that Bleuler's distinction, between core and accessory symptoms, which parallels the positive-negative distinction fell into disuse because of the difficulty in reliably assessing symptoms like flat affect, loose associations, etc. Andreasen (1982) developed a reliable scale to measure the negative symptom complex and used it to divide a group of schizophrenics into predominantly positive, predominantly negative, or mixed symptoms (individuals who do not meet
either positive or negative criteria or meet criteria for both; Andreasen & Olsen, 1982). The three groups of patients (positive, n = 18, negative, n = 16, mixed, n = 18) did not differ significantly on any demographic variables except education. Patients with predominantly negative symptomatology achieved the least educationally (negative = 11.06 yr, mixed = 12.05 yr, positive = 13.55 yr). The results of this study indicate that individuals with predominantly negative symptoms had poor premorbid adjustment, lower intellectual functioning, and signs of neuropathology. Individuals with positive symptoms had better premorbid adjustment, better overall functioning and cognitive functioning, and showed no signs of neuropathology. The mixed group scored between the positive and negative symptom groups on all variables (Andreasen & Olsen, 1982). A strong negative correlation was found between positive and negative symptoms. In Andreasen's preliminary work (1982; Andreasen & Olsen, 1982), she appears to have developed a reliable tool for separating schizophrenics into relatively homogeneous groups. Andreasen's scale for Assessing Negative Symptoms is comprised of five subscales: affective flattening or blunting, alogia or impoverished thinking, avolition-aphathy, anhedonia-asociality and attention. Items taken from the Present State Examination (a structured diagnostic interview) will be used to complete this scale and will be used as the rating of negative symptoms in the present study.

Eye Movements

The measures of oculomotion that have been studied in schizophrenia-
nics include smooth pursuit eye movements (SPEM) and saccadic eye movements.

**Smooth Pursuit Eye Movements** - Smooth pursuit eye movements (SPEM) are voluntary, slow movements that maintain an image on the fovea by matching the velocity of the eye with the velocity of the target. These movements occur in the horizontal, vertical or diagonal plane. The early work of Holzman and his associates (Holzman, Levy, Uhlenhuth, Proctor & Freeman, 1975; Holzman, et al., 1973; Holzman, Proctor, Levy, Yasillo, Meltzer & Hurt, 1974) identified deviant SPEM in some schizophrenics. This deficit was found to be worse in chronic schizophrenics than in recently diagnosed schizophrenics (Holzman et al., 1974). This suggests that poor tracking may be associated with a chronic course.

A number of methods have been used to quantify SPEM integrity. Of these a root-mean-square (RMS) analysis provides an estimate that is as sensitive or more sensitive than other methods of analysis (Iacono & Lykken, 1979). This procedure involves determining the tracking error throughout the tracking performance in terms of the difference, in standard deviation units, between the target signal and the subject's eye movements. Conceptually, this measure represents the degree of fit between the target signal and tracking performance (Iacono & Lykken, 1979). This method correlates highly with qualitative ratings and shows high test-retest reliability (Iacono & Lykken, 1979; 1981).

The RMS method of analysis also provides a good estimate of the extent to which a subject's eyes lag behind the target during tracking. This lag measure is relatively reliable (Iacono & Lykken, 1981).
Schizophrenics appear to have more phase lag than bipolar or unipolar depressives and normal individuals (Iacono & Koenig, 1983; Iacono, Peloquin, Lumry, & Valentine, 1982).

The tracking impairment has been identified consistently and involves numerous saccadic (fast) eye movements intruding upon a smooth following movement. This tracking deficit has been found in remitted schizophrenics (Iacono et al., 1982; Salzman, Klein, & Strauss, 1978), in both young (Kuechenmeister, Linton, & Mueller, 1977) and older schizophrenics (Holzman, Kringlen, Levy, Proctor, & Hakerman, 1978), and sex has not been shown to significantly influence the deficit (Iacono & Koenig, 1983; Iacono, Tuason, & Johnson, 1981). Neuroleptic medication also appears not to be a causal factor in the tracking deficit (Holzman et al., 1974; 1975; Mailet & Pichot, 1981; Shagass, Amadeo, & Overton, 1974). Finally, attentional demands of the task probably do not account for the deficit. Only extremely distracting tasks disrupt pursuit movements (Lipton, Frost, & Holzman, 1980; Pass, Salzman, Klorman, Kaskey, & Klein, 1978), and the deficit has been found by numerous investigators using various methodologies (see Iacono, 1983, for a review).

Saccadic Eye Movements - Saccades involve high velocity ballistic movement of the eyes. They serve to refixate vision and are apparently initiated voluntarily (Carpenter, 1977). However the time course (amplitude, velocity and duration) is preprogrammed and is not affected by practice or extra voluntary effort (Carpenter, 1977). There is normally very little variability in amplitude-velocity-duration
relationships in a variety of stimulus conditions, although velocity may be reduced by alcohol, sedatives, or fatigue (Carpenter, 1977).

Saccadic latency increases, to some extent, with amplitude although small saccades generally have the same latency regardless of amplitude (Carpenter, 1977). The normal range of saccadic latency is 150 to 250 msec (Levy-Schoen & Blanc-Garin, 1974). This latency may be reduced by the predictability of the target movements. However, if the number of possible target positions extends beyond two, latency is not reduced (Carpenter, 1977). A refractory period immediately following any saccadic move can also influence reaction time. A refractory period of 150 msec, during which time a second saccade cannot be generated, follows every saccade (Carpenter, 1977). Thus, the shortest possible time in which one saccade can follow another is 150 msec.

Saccades are usually accurate if the amplitude of the eye movement is less than 20° (Carpenter, 1977). However, some saccades to target movements under 20° appear to systematically undershoot the target position by an amount that has an almost linear relationship to the size of the initial saccade.

There has been little research on saccadic eye movements in schizophrenics. Levin, Jones, Stark, Merrin and Holzman (1982), using small groups (6 chronic and 3 normal controls) found no difference in saccadic latency or amplitude-velocity relationships. In another study with a larger subject sample, Levin, Holzman, Rothenberg and Lipton (1981) used a target that moved over unpredictable, variable amplitudes (2 to 24° in 1° steps) and with unpredictable variable intertrial intervals (1 to 6 seconds). Measures were taken for the left (target moved centre to
left) and right visual fields (target moved centre to right). No significant differences were found between schizophrenics, manic-depressives and normal controls for latency, velocity, duration, accuracy, or velocity-amplitude and duration-amplitude functions. However, the EOG was used to monitor eye movements and this recording technique may not be sufficiently sensitive to identify small (1-2°) inaccuracies in movement and subsequent refixation saccades (Iacono, & Koenig, 1983). Iacono et al., (1981) also used unpredictable intertrial intervals and EOG, and found no significant differences in saccadic latency between schizophrenics and normal controls. However, Cegalis, Sweeney, and Delis (1982) used a more sensitive, infra-red eye monitoring device and presented a series of target displacements of equal amplitude over equal intertrial intervals. Twenty schizophrenic, 20 nonpsychotic control, and 20 normal controls were used (mean ages were 17.1, 17.4 and 26 years). Schizophrenics were found to be more inaccurate than normal people and psychiatric controls, and they showed lower velocities and peak velocities than the normals but not the psychiatric controls. As was noted above, normals can take advantage of predictable target movements, and, thus, these findings may represent a learning effect rather than a index of neuropathology. In order to control for this, Cegalis et al. (1982) analysed the first four cycles separately and obtained results comparable to the overall results.

Overview of Current Project and Hypothesis

A strategy aimed at improving present methods in schizophrenia research is proposed. All psychotic patients, without diagnosed organic
disorders, should be included to compensate for the imprecision in contemporary diagnostic procedures; multiple measures should be used to identify variables that cluster within subgroups and that discriminate between subgroups of psychotic patients. Finally, any identified category should be evaluated with regard to how well it predicts response to treatment and prognosis. The aim of the present study was to isolate a subgroup of psychotic patients who show poor adjustment nine to 18 months after their initial psychotic episode. Three variables that are putative predictors of poor prognosis (process or negative) type schizophrenia were studied. Poor premorbid status, negative symptoms and eye movement anomalies were used in the present study to predict rehospitalization, general level of adjustment and employment-heterosexual adjustment nine to 18 months after the first psychotic episode. The specific hypothesis of this study can be stated as follows: the combination of poor premorbid adjustment, numerous negative symptoms, and disrupted smooth pursuit eye tracking will be found in a subgroup that shows poor general adjustment, poor employment-heterosexual adjustment, and one or more periods of rehospitalization during the follow-up period. This pattern of predictors will be reversed for a second subgroup of patients who show good adjustment and no rehospitalization. The study described above, by its very nature, represents exploratory research. Further studies will be conducted to replicate and extend the findings from this study.
METHOD

Subjects

Sixty-nine psychiatric patients were recruited for the first stage of a epidemiological study on psychosocial markers and predictors of psychopathology. An objective of this study was to determine the incidence of first break psychosis in the Vancouver metropolitan area during the period extending from February, 1982 to February, 1984. Patients were referred from all psychiatric hospitals in the Vancouver area as well as from all community mental health centres and private practice psychiatrists who agreed to assist the project. In addition, a random sample of one of every six general practitioners in the area was solicited to refer patients. All participants had experienced their first treated psychotic episode within three months of entering this study. Of this initial group, 51 also participated in a psychophysiological assessment. Thirty-three (64.7%) of the patients that were given the initial psychophysiological testing were reassessed 9 to 18 months following the onset of their psychosis. Seventeen of the 51 subjects that were tested initially were not available for or were excluded from follow-up: seven moved out of the Vancouver area, five refused to be retested, one was excluded because of recently diagnosed neuropathology, one because he used street drugs immediately before the experimental session, one committed suicide and two could not be released from hospital for the retest. Four subjects who received only the social assessment during the initial period were also included in the follow-up. This produced a sample of 37 subjects (see Table 1).
Table 1  
Characteristics of the Subjects  

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Number</th>
<th>Medications $^1$</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Total</td>
</tr>
<tr>
<td>Schizophreniform</td>
<td>17</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>Major Depression</td>
<td>7</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Bipolar</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Paranoid</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

$^1$Psychoactive medication at follow-up: 1 = antipsychotics, 2 = antidepressants, 3 = lithium, 4 = antiparkinsonian, 5 = antianxiety.

$^2$Number of subjects on one or more medication.
At the time of the first testing 36 of the 37 subjects were psychiatric inpatients and one was an outpatient. All patients presented with psychotic symptoms (delusions and/or hallucinations). Individuals with a diagnosed neurological disorder were excluded. Diagnostic decisions were based on DSM III criteria and reflect the consensus of at least two psychiatrists and two clinical psychologists. Twenty patients received a diagnosis of schizophreniform disorder, nine of major depression, six of bipolar disorder—manic, and two of paranoid disorder. All the patients with affective psychoses had mood incongruent delusions and/or hallucinations. All participants were receiving psychotropic medication at the time of the first evaluation. There were 28 males and nine females between the ages of 16 and 47 (M = 24.37, SD = 8.82).

At the time of the second testing, four participants were receiving treatment as inpatients, 23 were treated as on outpatient basis, and ten were receiving no psychiatric treatment. Fifteen individuals were medication free at follow-up (see Table 1). All subjects gave informed consent and were paid $10 for their participation.

**Interviews and Apparatus**

**Interviews**

At the time each subject experienced his or her first psychotic episode, a screening schedule was completed based on information obtained from the referring agency (hospital, community care team, private psychiatrist, or general practitioner, see Appendix A). This schedule was used to screen out individuals with organic mental disorders and to identify those who were potentially psychotic.
If a subject was deemed appropriate for inclusion in the study and gave informed consent, the Present State Examination was completed and was used as a basis for making diagnostic decisions. A different interview was completed at follow-up to obtain information regarding level of adjustment both during and at the time of follow-up (see Appendix 2). The items from this interview that were used to rate the presence of symptoms (Items 6-51) were taken from the Diagnostic Interview Schedule (National Institute of Mental Health, 1981). Items 58, 59 and 63 to 67 from the follow-up interview were used to make a rating of premorbid adjustment on the abbreviated form of the Phillips Premorbid Adjustment Scale (Harris, 1975, see Appendix C). A rating of the severity of negative symptoms was made by summing items 19, 20, 58, 107, 128, 129 and 138 of the Present State Exam (see Appendix D). A rating of employment-heterosexual adjustment was made using questions 63 to 71, and 53c to 53f from the follow-up interview to complete items 1a, 3a and 4 of the Prognostic Scale (Strauss & Carpenter, 1974, see Appendix E). Finally, the Gobal Assessment Scale (GAS) was used to make a rating of adjustment for the month preceding the follow-up testing (see Appendix F). Information from questions 6 to 51, and 53, 54 of the follow-up interview were used to make this rating.

Apparatus

A Wavetek Digital VCG Model 113 sine wave generator was used to drive a target horizontally across the screen of a Tektronix Type RM 15 single beam oscilloscope. The target, which simulated the harmonic motion of a swinging pendulum, served as the stimulus for smooth pursuit tracking. The target consisted of a circle approximately 5 mm in
diameter with a dot in the centre. To assess saccadic eye tracking proficiency, a spot of light controlled by a random interval random amplitude square wave generator appeared to move horizontally across a 30 cm square, semi-transparent plastic screen. The screen was placed at the rear of a white plastic box to limit distracting stimuli. Red light-emitting diodes placed behind the screen served as the stimuli. When illuminated the diodes appeared as points of red light, approximately 5 mm in diameter. These light sources were activated by a paper tape-operated switching system. The time intervals elapsing between the illumination of the diodes were one, two, three, or four seconds and the distances between diodes corresponded to eye movement amplitudes of 12, 14, 16 or 18 degrees of visual arc. The diodes were arranged such that the target appeared to move from a minimum of 4° left or right of centre to a maximum of 20° left or right of centre. A chin and forehead rest placed 30 cm in front of the equipment served to stabilize the subject’s head for the sinusoidal and square wave tasks.

One cm silver/silver chloride electrodes were attached to the abraded outer canthi for horizontal EOG recording. A third electrode placed above the right eye and referenced to the electrode at the right outer canthus, was used to monitor blinks. A ground electrode was attached to the left ear lobe. A Gulf and Western model 200 infra-red (IR) eye movement monitor, attached to a pair of lensless eye glasses, was used to monitor movements of the left and right eyes separately. Signals from both the EOG and IR systems were recorded simultaneously on a Beckman RM Dynograph and on a magnetic tape using a Vetter FM Model A
tape recorder. Modified type 9806A AC couplers were used for EOG, IR, and target input on the dynograph. The couplers were set to DC for the IR and target signals for both the sinusoidal and square wave tasks. Time constants of three seconds for the sinusoidal task and ten seconds for the square wave tasks were used for EOG recording. AC coupling was used for recording the EOG in order to reduce the contribution of baseline shift to the records. A time constant of .1 seconds was used to monitor blinks.

Procedure

The Present State Examination (PSE) was conducted at the time each subject was recruited by a psychiatrist trained in the use of this instrument. With appropriate training, the PSE is reported to have a reliability of .84 (Shapiro & Jablonsky, 1976). No reliability check was done on these interviews in the present study. This instrument was used to obtain a rating of adjustment for the month preceding the interview. The PSE was administered as close as possible to the time of the first testing. A number of psychophysiological measures were also taken at this time. Among these was a measure of .4 Hz smooth pursuit eye movements (SPEM). The procedure used for this initial SPEM measurement was the same as that used in the follow-up except for the addition of the infra-red eye monitors during the follow-up assessment.

At the time of the follow-up, subjects were shown the apparatus and given an explanation of the experimental procedures before the experiment began. Subjects sat in front of the oscilloscope while EOG electrodes were attached and IR monitors positioned. The subject's head was
stabilized in the chin and forehead rest, and the lights were dimmed. Tape recorded instructions were used to request that the subject refrain from blinking, relax, hold his or her head still and follow the target closely. IR and EOG recordings were calibrated at this time. A .4 Hz oscillating, sinusoidal target was presented for 20 cycles. The subject was then asked to move in front of the plastic screen and the same procedure was repeated for the square wave task. This task was repeated twice with at least ten seconds between tasks. The follow-up interview was conducted either immediately before or immediately after the psychophysiological testing. This interview was conducted by the experimenter or one of three research assistants. The total duration of each session was from two to two and a half hours.

Data Quantification

Interview Data.

The scores on the negative symptom rating ranged from zero to 15. Zero would indicate that no negative symptoms were judged to be present while 15 would be severely incapacitated. The rating of premorbid adjustment ranged from one (good premorbid adjustment) to 12 (very poor premorbid adjustment). Global adjustment (GAS) ranged from 100 ("superior functioning") to one ("needs constant supervision"). Finally, employment-heterosexual adjustment scores ranged from zero to eight. A score of zero indicates no employment or heterosexual interest while 8 indicates full-time employment and either married or dates regularly. Interater reliability for the above ratings was assessed by comparing a rating made by the experimenter with one made by a second
rater. The second rater was blind to the identity of the subjects. Inconsistencies were resolved through mutual agreement.

The follow-up interviews were conducted by the experimenter or one of three research assistants. Six of 37 interviews were conducted by an interviewer with an observer also present in the interview room. The observer noted the subject's responses but did not participate in the interviews. These observed interviews were used to check interrater reliability.

Eye Movement Data. Taped EOG, IR and target channels from the .4 Hz smooth pursuit eye-tracking task were fed into a Digital Equipment Corporation LSI 11/23 digital computer. The computer was programmed to compute root-mean-square (RMS) error deviation of each data channel (EOG, left eye infra-red, and right eye infra-red) from the target channel. The amplitudes of the channels were set equal with respect to their respective envelopes, and the channels aligned for phase differences. The process of aligning the channels produced an estimate of the degree to which an individual's eyes lag behind the target. These two measures (RMS error and phase lag) were taken from .4 Hz eye tracking performance for EOG at the time of the first testing and for EOG, left eye infra-red, and right eye infra-red at the follow-up testing.

Taped saccadic eye movement data, recorded only during the follow-up testing, was also fed into the computer which was programmed to compute latency, accuracy and mean velocity of each eye movement for the IR channels. Latency was the interval (in msec) between the target
movement and the initiation of an eye movement. Accuracy was divided into overshoot and undershoot (in degrees of visual arc). Overshoot was the difference between eye movements greater than the target movement and the target movement. Undershoot was the difference between eye movements less than the target movement and the target movements. Mean velocity was a function of the magnitude and the duration of the saccadic movement (in degrees of visual arc per). In order to compute these measures a manual calibration value had to be calculated. The calibration value was used to translate voltages from the eye movement channels to amplitudes of eye movement in degrees of visual arc. The calibration provided a figure in volts that corresponded to each degree of visual arc. This value was computed for each subject by measuring the voltage of signals while the subject was fixating on points known to be certain number of degrees apart. Eight points to the left and eight points to the right of centre were used for this purpose. The average value associated with eye movements between these points was transformed to volts per degree and was used to set the calibration value. Movements that occurred at the same time as blinks were deleted.
RESULTS

This section of the thesis is divided into several subsections. The first, entitled Reliability and Reduction of Measures, presents the procedure and rationale followed in reducing the saccadic eye movement data, the interjudge reliability coefficients for the various rating scales and the test-retest reliability estimates for smooth pursuit and saccadic eye movement data. Also presented are the correlations between simultaneously recorded EOG and IR estimates of smooth pursuit tracking proficiency.

The second subsection deals with the predictive validity of the eye tracking and rating data. The predictive variables are smooth pursuit RMS error and phase lag from the first testing, the score on the negative symptom scale, and the Phillips rating of premorbid adjustment. The variables that were predicted were GAS score based on adjustment over the month preceding the follow-up interview, employment-heterosexual adjustment during the follow-up period, and whether or not the patient was rehospitalized.

Two steps were taken in the analysis of the predictive validity. As a first step, correlations were computed between the four predictor variables and the three outcome measures. (While the term "outcome measure" is usually reserved for measures of outcome in a treatment study, for convenience of expression the term is used in this discussion to refer to the level of adjustment over the follow-up period). Second, each outcome measure was dichotomized to produce one group with poor adjustment and a second with good adjustment. A score of 65 on the
GAS (generally functioning with some difficulty, see Appendix F) was used as the cut off. For the employment-heterosexual adjustment (see Appendix E), a cut-off of 2 was used since this score most nearly split the group into halves. The group was also dichotomized according to whether patients were rehospitalized at least once or never rehospitalized. A discriminant analysis was executed for each of these dichotomized variables in order to identify the best combination of predictor variables. This statistical analysis linearly combines the best predictors of outcome in a stepwise procedure. Each measure that accounts for a unique proportion of the variance is added to the prediction formula. Two groups that are as statistically distinct as possible are produced. The statistical significance of the discriminant function is determined using a chi square statistic. Four subjects did not complete the eye movement task on the first testing and were deleted from discriminant analyses that incorporated eye movement data. If the eye movement variables were not included in the set of predictor variables, all 37 subjects were used.

The third subsection entitled Concurrent Validity deals with the ability of concurrently recorded eye movement data to identify outcome status at follow-up. The variables used to identify outcome were smooth pursuit RMS error and phase lag, saccadic latency, average velocity, average overshoot, and average undershoot. The outcome variables that were used for concurrent validation were the same as those used in assessing predictive validity (GAS score, employment-heterosexual adjustment, and rehospitalization). The analyses used to assess concur-
rent validity were also the same as those used in determining predictive validity.

The fourth subsection entitled Exploratory Analyses deals with variables that were used to describe the patients and that were found to have some discriminating value. Correlations were computed between the age of the patients at the time of their first psychotic episode and the predictor and outcome variables. Further correlations were computed between the duration of the first hospitalization and the predictor and outcome measures. In order to assess the impact of these variables on the prediction of outcome, a discriminant analysis was executed, adding age and duration of hospitalization to the list of predictor variables, for each of the outcome measures. Finally, since the saccadic measures were not obtained at the first testing, the value of these measures as predictors of outcome could not be assessed. In an exploratory analysis, these saccadic measures were added to the predictor variables and a discriminant analysis computed for each of the outcome measures.

Reliability and Reduction of Measures

Interview Data. The interjudge reliability of the follow-up interview was assessed by comparing all recorded responses across the interviewer's and observer's interview schedules. There was 100% agreement between interviewer and observer on all items of the follow-up interview for the six pairs of interviews checked. The interjudge reliability of the Abbreviated Scale of Premorbid Sexual Adjustment and the Abbreviated Scale of Premorbid Social Personal Adjustment were high, $r = .81$, and $r = .85$, respectively.
Item three of the Strauss-Carpenter Prognostic scale was not sufficiently sensitive to detect variability in social contacts during the follow-up period for this group of patients. This item was dropped from further analyses. The interjudge reliability for the ratings of heterosexual and employment adjustment during the follow up period were .93, and .92, respectively. The interjudge reliability for the ratings of global adjustment (i.e., the GAS) during the month before the follow-up interview was .82.

Smooth Pursuit Eye Movements. Consistent with earlier studies (Iacono & Lykken, 1979; 1981) the log of the median RMS value was used as an index of eye tracking integrity. The left infra-red, right infra-red and EOG measures of median RMS values were all highly correlated \( r = .85 \) to \( r = .94 \). In order to be consistent with previous studies, almost all of which have used the EOG, and because of the high level of agreement between the three measures, the EOG was used for smooth pursuit analyses. As with the RMS values, the measures of phase lag during eye tracking correlated highly across the EOG and infra-red measures \( r = .81 \) to .91. The EOG measure of phase lag was also used for analysis.

The test-retest reliability between the first and follow-up testings was moderately high for the RMS error \( r = .61, p < .01 \) and low for the measure of phase lag \( r = .32, p < .05 \). There was a moderately high correlation between RMS error and phase lag measures at both the first, \( r = -.61, p < .01 \), and second \( r = -.64, p < .01 \) testings. Consistent with previous findings of Iacono and colleagues (Iacono & Koenig, 1983; Iacono & Lykken, 1979), these negative correlations indicate that good
smooth pursuit eye tracking is associated with a tendency for the eyes to lag behind the target without producing "catch-up" saccades.

Saccadic Eye Movements. The saccadic eye movement task was not completed at the first testing session. Test-retest reliability for this task was, therefore, obtained by comparing performances on two identical saccadic tasks given at the follow-up testing session. The left and right eye latencies and the latencies for leftward and rightward movements were similar (see Table 2). These measures were collapsed and one measure of latency was used for further analyses. The test-retest reliability of the latency measure was \( r = .91 \). Measures of average saccadic velocity were obtained for left and right eyes, for left and rightward movements over five amplitude ranges (1-5, 6-10, 11-15, 16-20, and over 20 degrees of visual arc). There were insufficient observations in the 1 to 5, and over 20 degree ranges to compute reliable statistics. These ranges were therefore dropped from the analysis. Velocity measures over direction of movement and between left and right eyes were essentially identical. These measures were therefore collapsed to produce three measures of average saccadic velocity. These were for saccadic eye movements from 6 to 10, 11 to 15, and 16 to 20 degrees of visual arc. The test-retest reliability of these measures was \( r = .52 \), \( r = .85 \), and \( r = .77 \). As was expected (Carpenter, 1977), there was an increase in velocity when the magnitude of the eye movement increased (\( \bar{M}_{6-10} = 179 \) deg/sec, \( \bar{M}_{11-15} = 241 \) deg/sec, \( \bar{M}_{16-20} = 290 \) deg/sec). Since the majority of eye movements fell within the 11 to 15 degree range, this measure was used in further analyses (see Table 2).
Table 2

Saccadic Eye Movements for Left and Right Eyes over Leftward and Rightward Movements

<table>
<thead>
<tr>
<th>Eye and Direction of Movement</th>
<th>Saccadic Eye Movement Measure</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Velocity&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Latency&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Accuracy&lt;sup&gt;3&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Left Eye Leftward</td>
<td>244</td>
<td>36</td>
<td>196</td>
<td>40</td>
<td>2.62</td>
</tr>
<tr>
<td>Left Eye Rightward</td>
<td>246</td>
<td>48</td>
<td>193</td>
<td>31</td>
<td>2.34</td>
</tr>
<tr>
<td>Right Eye Leftward</td>
<td>233</td>
<td>37</td>
<td>197</td>
<td>38</td>
<td>1.30</td>
</tr>
<tr>
<td>Right Eye Rightward</td>
<td>248</td>
<td>43</td>
<td>190</td>
<td>31</td>
<td>2.29</td>
</tr>
</tbody>
</table>

<sup>1</sup>Velocity = the average velocity of the eye in degrees of visual arc per sec.

<sup>2</sup>Latency = the time elapsed (in msec) between the onset of target movement and the onset of eye movement.

<sup>3</sup>Accuracy = the difference, in degrees of visual arc, between the amplitude of the target movement and the amplitude of the eye movement.
Measures of saccadic eye movement accuracy were obtained by subtracting the magnitude of the target movement from the magnitude of the eye movement. These measures were averaged to produce mean measures of overshoot (an eye movement greater than the target movement), undershoot (an eye movement less than the target movement) for the left and right eyes over left- and rightward movements. Accuracies over left and right eyes across leftward and rightward movements were essentially the same (see Table 2). These measures were collapsed to give average overshoot and average undershoot and were used for further analyses. The test-retest reliability of overshoot was, \( r = .73 \), and of undershoot, \( r = .79 \). These findings indicate that the various measures of saccadic eye movement are stable. The EOG was not used in the saccadic task because of the imprecision in measuring small saccades that is associated with this measuring technique (Iacono & Koenig, 1983).

Analysis of Results

Predictive Validity. Pearson correlations were computed for the predictor variables (RMS error and phase lag from the first testing, premorbid adjustment and negative symptoms during the first psychotic episode), and outcome measures (GAS scores at the time of follow-up and employment-heterosexual adjustment during the nine to 18 month follow-up period). Since rehospitalization was a dichotomous variable, point-biserial correlations were computed for this variable. As can be seen in Table 3, GAS scores were found to be significantly related to premorbid adjustment, \( r = -.401, p = .007 \), and phase lag, \( r = .339, p = .027 \). Neither negative symptoms nor RMS error were significantly related to
Table 3
Predictor and Outcome Variable Correlations

<table>
<thead>
<tr>
<th>Predictor Measures</th>
<th>Outcome Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smooth Pursuit RMS Error</td>
<td>GAS^{3}</td>
</tr>
<tr>
<td>Phase Lag</td>
<td>E-H</td>
</tr>
<tr>
<td>Negative Symptoms</td>
<td>r = -.642</td>
</tr>
<tr>
<td>Phase lag</td>
<td>r = -.374</td>
</tr>
<tr>
<td>Negative symptoms</td>
<td>p = .125</td>
</tr>
<tr>
<td>Premorbid Status</td>
<td>p = .007</td>
</tr>
<tr>
<td>GAS^{3}</td>
<td>r = .662</td>
</tr>
<tr>
<td>E-H^{4} Adjustment</td>
<td>r = .070</td>
</tr>
<tr>
<td>Rehospitalization^{5}</td>
<td>p = .361</td>
</tr>
</tbody>
</table>

1Pearson correlations are used unless otherwise reported. Correlations that are underlined are statistically significant at the p < .05 level (two-tailed significance).

2Smooth pursuit eye movement task from the first test session.

3Global adjustment scale.

4Employment-heterosexual adjustment.

5Rehospitalization is a dichotomous variable, correlations in this column are point biseral.
GAS scores. Poor employment-heterosexual adjustment was significantly related to premorbid adjustment, \( r = .362, p = .014 \), and negative symptoms, \( r = .275, p = .050 \). These results indicate that poor premorbid adjustment tended to precede poor adjustment during and at the time of follow-up, while negative symptoms were more likely to occur in individuals who later showed poor employment-heterosexual adjustment. There was also a tendency for individuals who anticipated a moving target (i.e., moved their eyes ahead of the target) in the original testing to show low GAS scores indicative of poor adjustment at follow-up.

Table 4 shows the means and standard deviations for each of the predictor variables after they had been dichotomized into good and poor adjustment on each of the dependent measures. For both GAS and employment-heterosexual adjustment all four predictor measures showed a consistent difference in the predicted direction between groups. Poorly adjusted subjects had more negative symptoms, poor premorbid adjustment, numerous eye tracking errors and tended to move their eyes ahead of the moving target. All the predictor measures were similar across the rehospitalized-nonrehospitalized groups.

In order to obtain the best combination of predictor variables separate discriminant analyses were computed for GAS scores, employment-heterosexual adjustment, and rehospitalization. GAS scores were best predicted by a combination of negative symptoms, and premorbid adjustment, \( X^2(2) = 7.39, n = 37, p = .025 \). Together these variables were able to correctly predict 27 (73%) of the 37 subjects. Both RMS error and phase lag were significantly related to negative symptoms, \( r = .329, p = .031 \) and \( r = -.374, p = .016 \), and did not account for any
Table 4
Good and Poor Adjustment Groups for each Outcome Variable

<table>
<thead>
<tr>
<th>Predictor Measures</th>
<th>GAS 1 Good n=11</th>
<th>Poor n=22</th>
<th>E-H Adjustment 2 Good n=15</th>
<th>Poor n=18</th>
<th>Rehospitalization 3 Good n=23</th>
<th>Poor n=10</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMS error M</td>
<td>2.025</td>
<td>2.116</td>
<td>2.043</td>
<td>2.121</td>
<td>2.186</td>
<td>2.084</td>
</tr>
<tr>
<td></td>
<td>0.213</td>
<td>0.198</td>
<td>0.178</td>
<td>0.222</td>
<td>0.179</td>
<td>0.264</td>
</tr>
<tr>
<td>Phase lag M</td>
<td>-1.182</td>
<td>-5.182</td>
<td>-1.400</td>
<td>-5.889</td>
<td>-3.348</td>
<td>-5.000</td>
</tr>
<tr>
<td>Negative Symptoms M</td>
<td>3.000</td>
<td>4.364</td>
<td>3.533</td>
<td>4.222</td>
<td>3.826</td>
<td>4.100</td>
</tr>
<tr>
<td></td>
<td>2.608</td>
<td>1.989</td>
<td>2.446</td>
<td>2.130</td>
<td>2.462</td>
<td>1.853</td>
</tr>
<tr>
<td>Premorbid Status M</td>
<td>2.454</td>
<td>4.273</td>
<td>2.533</td>
<td>4.611</td>
<td>3.652</td>
<td>3.700</td>
</tr>
<tr>
<td></td>
<td>1.440</td>
<td>2.292</td>
<td>1.356</td>
<td>2.355</td>
<td>2.403</td>
<td>1.767</td>
</tr>
</tbody>
</table>

1GAS = Global Assessment Scale: Good adjustment and poor adjustment.
2E-H Adjustment = Employment-heterosexual adjustment: Good adjustment and poor adjustment.
3Rehospitalization: Good adjustment = not rehospitalized and poor adjustment =rehospitalized one or more times.
4Log RMS error from smooth pursuit eye tracking at the first testing. Unit of measurement = arbitrary units here.
5Phase lag from smooth pursuit eye tracking at the first testing. Unit of measurement = degrees of sine wave. A negative phase lag signifies that the subject’s eye were ahead of the target.
additional variability in this prediction formula. As can be seen in Table 5, 18 (69%) of the 26 subjects who had poor adjustment at follow-up (i.e. low GAS scores) were correctly predicted from level of premorbid adjustment and number of negative symptoms, while nine (82%) of the 11 well adjusted individuals were correctly predicted.

Employment-heterosexual adjustment during the follow-up period was successfully predicted by RMS error and level of premorbid adjustment, χ²(2) = 8.79, n = 33, p = .012. Four subjects were deleted from this analysis because of missing eye movement data. It can be seen from Table 5 that 23 (70%) of the 33 subjects used in this analysis were correctly identified by this combination of predictors. Eleven (61%) of the 18 individuals with poor adjustment during the follow-up period were correctly identified from their premorbid adjustment rating and RMS error scores, while 12 (80%) of the 15 well adjusted individuals were correctly identified from their scores on these variables. Of the 18 individuals who were accurately predicted as having low GAS scores (poor adjustment), 11 were also accurately predicted as having poor employment-heterosexual adjustment; i.e., 11 subjects were poorly adjusted according to the two outcome measures and were accurately predicted as being such. Eight of the nine subjects who had high GAS scores also had high employment adjustment scores. None of the predictor variables were successful in identifying rehospitalization.

Concurrent Validity. Table 6 shows the Pearson correlations that were computed between the eye movement measures obtained at follow-up (Smooth pursuit RMS error and phase lag and saccadic latency, average
<table>
<thead>
<tr>
<th>Actual Groups(^2)</th>
<th>N</th>
<th>Predicted Groups(^1)</th>
<th>Total Correctly Predicted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>GAS(^3)</td>
<td>37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td></td>
<td>9 (82%)</td>
<td>2 (18%)</td>
</tr>
<tr>
<td>Poor</td>
<td></td>
<td>8 (31%)</td>
<td>18 (69%)</td>
</tr>
<tr>
<td>E-H(^4) Adjustment</td>
<td>33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td></td>
<td>12 (80%)</td>
<td>3 (20%)</td>
</tr>
<tr>
<td>Poor</td>
<td></td>
<td>7 (39%)</td>
<td>11 (61%)</td>
</tr>
</tbody>
</table>

\(^1\)Predicted group of membership according to a combination of predictor variables.

\(^2\)Actual group of membership according to the outcome measures.

\(^3\)Global Assessment Scale: Good adjustment and poor adjustment. Predicted by negative symptoms and premorbid adjustment.

\(^4\)Employment-heterosexual adjustment: Good adjustment and poor adjustment. Predicted by RMS error and premorbid adjustment.
Table 6
Concurrent and Outcome Variable Correlations

<table>
<thead>
<tr>
<th>Concurrent Measures</th>
<th>Smooth Pursuit</th>
<th>Saccadic Eye Movements</th>
<th>Outcome Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RMS Error</td>
<td>Phase Lag</td>
<td>Velocity</td>
</tr>
<tr>
<td>RMS error</td>
<td>-</td>
<td>r = -.605</td>
<td>r = -.159</td>
</tr>
<tr>
<td>Phase lag</td>
<td>-</td>
<td>r = .373</td>
<td>r = -.384</td>
</tr>
<tr>
<td>Saccadic velocity</td>
<td>-</td>
<td>r = .106</td>
<td>r = -.322</td>
</tr>
<tr>
<td>Saccadic overshoot</td>
<td>-</td>
<td>r = .508</td>
<td>r = .209</td>
</tr>
<tr>
<td></td>
<td></td>
<td>p = .001</td>
<td>p = .121</td>
</tr>
<tr>
<td>Saccadic undershoot</td>
<td>-</td>
<td>r = .080</td>
<td>r = .038</td>
</tr>
<tr>
<td></td>
<td></td>
<td>p = .326</td>
<td>p = .415</td>
</tr>
<tr>
<td>Saccadic latency</td>
<td>-</td>
<td>r = -.203</td>
<td>r = -.064</td>
</tr>
<tr>
<td></td>
<td></td>
<td>p = .131</td>
<td>p = .357</td>
</tr>
<tr>
<td>GAS</td>
<td></td>
<td>r = .662</td>
<td>r = .112</td>
</tr>
<tr>
<td></td>
<td></td>
<td>p = .001</td>
<td>p = .279</td>
</tr>
<tr>
<td>E-H Adjustment</td>
<td>-</td>
<td>r = .070</td>
<td></td>
</tr>
<tr>
<td>Rehospitalization</td>
<td>-</td>
<td>p = .361</td>
<td></td>
</tr>
</tbody>
</table>

1Pearson correlations are used unless otherwise reported. Correlations that are underlined are statistically significant at the p < .05 level.
2Global Assessment Scale.
3Employment-heterosexual adjustment.
4Rehospitalization is a dichotomous variable. Correlation in this column are point biserial.
5Smooth pursuit eye movement task from the follow-up session.
velocity, average overshoot and average undershoot), and the follow-up measures (GAS rating at follow-up and employment-heterosexual adjustment during follow-up). Point biserial correlations were computed between rehospitalization and the eye movement measures obtained at follow-up (see Table 6). It can be seen from Table 6 that there were no significant relationships between any of the follow-up eye-movement measures and the three measures of adjustment at follow-up.

Discriminant analyses were computed for each of the three dichotomized outcome measures over the eye-movement measures obtained at follow-up. Although two of the three discriminant analyses failed to produce significant results at the .05 level, given the exploratory nature of this project the results of the two analyses which attained borderline significance are presented here. Whether or not the relationships indicated by these analyses are important ones must, of course be determined with replication. The combination of RMS error and average saccadic overshoot approached significance in identifying GAS scores at follow-up, X^2(2) = 5.66, n = 32, p = .059. Together these variables correctly identified 24 (75%) of the 32 subjects used in this analysis. Five subjects were deleted from this analysis because of missing eye movement data. Eighteen (78%) of the 23 individuals who scored low on the GAS were correctly predicted from RMS error and average saccadic overshoot (see Table 7). Both phase lag and average saccadic undershoot were significantly related to RMS error, r = -.654, p < .001 and r = .555, p < .001, and did not account for any additional variability in the prediction of GAS scores.

Employment-heterosexual adjustment during the follow-up period was
Table 7
Concurrent Validity of Eye Movement Measures

<table>
<thead>
<tr>
<th>Actual Group²</th>
<th>N</th>
<th>Predicted Groups¹</th>
<th>Total Correctly Predicted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Actual Group²</td>
<td>Predicted Group¹</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GAS³</td>
<td>E-H⁴ Adjust</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 (67%)</td>
<td>3 (33%)</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 (57%)</td>
<td>6 (43%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Poor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 (20%)</td>
<td>16 (80%)</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18 (78%)</td>
<td>5 (22%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Poor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 (22%)</td>
<td>7 (78%)</td>
</tr>
</tbody>
</table>

¹Identified group of membership according to a combination of concurrently assessed variables.
²Actual group of membership according to the outcome measure.
³Global Assessment Scale: Good adjustment and poor adjustment.
   Predicted by RMS error and saccadic overshoot.
⁴Employment-heterosexual adjustment: Good adjustment and poor adjustment.
   Predicted by RMS error, phase lag, and saccadic average velocity.
⁵Rehospitalization: Good = not rehospitalized during follow-up, poor = rehospitalized one or more times. Predicted by RMS error and overshoot.
related to the combination of RMS error, phase lag, and saccadic average velocity. This combination approached statistical significance, $X^2(3) = 7.32$, $n = 34$, $p = .061$. Together these variables identified 24 (71%) of the 34 subjects used in this analysis. Three subjects were deleted because of missing eye movement data. Sixteen (80%) of the 20 individuals who scored low on employment-heterosexual adjustment were correctly predicted while eight (51%) of the 14 well adjusted subjects were correctly predicted (see Table 7).

Rehospitalization during the follow-up period was associated with greater RMS error and less mean saccadic overshoot, $X^2(2) = 6.09$, $n = 32$, $p = .047$. Twenty-five (78%) of the 32 subjects included in this analysis were correctly classified (see Table 7). Seven (78%) of the nine subjects who were rehospitalized were correctly predicted from their RMS error and saccadic overshoot values while 18 (78%) of the non-rehospitalized group were accurately predicted. Phase lag and average saccadic undershoot were both significantly related to RMS error, $r = -.644$ and $r = .538$, and did not contribute any additional variance to the prediction formula.

**Exploratory Analyses.** From Table 8 it can be seen that the duration of hospitalization at the time of the first psychotic episode was found to be significantly related to GAS score at follow-up, $r = -.513$, $p < .001$, and to level of employment-heterosexual adjustment during follow-up $r = .324$, $p = .025$. These relationships indicate a trend towards poorer adjustment during follow-up in individuals who initially spend extended periods of time in hospital. Duration of hospitalization
Table 8
Age and Duration of Hospitalization Correlations with Predictor and Outcome Variables.

<table>
<thead>
<tr>
<th>Predictor Measures</th>
<th>Outcome Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smooth Pursuit²</td>
<td>E-H Rehospitalization⁵</td>
</tr>
<tr>
<td>RMS Error</td>
<td>GAS³</td>
</tr>
<tr>
<td>Phase Lag</td>
<td></td>
</tr>
<tr>
<td>Negative Symptoms</td>
<td></td>
</tr>
<tr>
<td>Premorbid Status</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age⁶</th>
<th>Smooth Pursuit²</th>
<th>Negative Symptoms</th>
<th>Premorbid Status</th>
<th>E-H Rehospitalization⁵</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age⁶</td>
<td>r = .124</td>
<td>r = .335</td>
<td>r = -.386</td>
<td>r = -.318</td>
</tr>
<tr>
<td></td>
<td>p = .245</td>
<td>p = .028</td>
<td>p = .009</td>
<td>p = .028</td>
</tr>
<tr>
<td>Duration of Hospitalization</td>
<td>r = .132</td>
<td>r = -.190</td>
<td>r = .093</td>
<td>r = .201</td>
</tr>
</tbody>
</table>

¹Pearson correlations are used unless otherwise reported. Correlations that are underlined are statistically significant at the p<.05 level (two-tailed significance).
²Smooth pursuit eye movement task from the first test session.
³Global adjustment scale.
⁴Employment-heterosexual adjustment.
⁵Rehospitalization is a dichotomous variable, correlations with this variable are point biserial.
⁶Age at the time of the first psychiatric hospitalization or age at referral to this study if the patient was not hospitalized.
was not significantly related to RMS error, \( r = .473 \), or phase lag from the first testing.

Table 8 summarizes the relationships between age and the predictor and outcome measures. The age of the subjects at the time of their first psychotic episode was found to be significantly related to negative symptoms, \( r = -.386, p = .009 \), premorbid adjustment, \( r = -.318, p = .028 \), GAS scores, \( r = .417, p = .005 \), and phase lag, \( r = .335, p = .028 \). These relations indicate a tendency for older subjects in this sample to have fewer negative symptoms, better premorbid adjustment, better adjustment at follow-up and more phase lag during eye tracking than did younger subjects.

In order to assess the impact of these variables on the prediction of outcome, discriminant analyses were computed using the predictor variables (RMS error, phase lag, premorbid adjustment and negative symptoms) plus age and duration of hospitalization over the three outcome measures (GAS, employment-heterosexual adjustment, and rehospitalization). With these variables added to the prediction formula, GAS scores were best predicted by age and premorbid status \( \chi^2(2) = 8.46, n = 37, p = .014 \). Of the 37 subjects used in this analysis 28 (76%) were correctly predicted. This is a slight improvement on the 27 (73%) that were correctly predicted when negative symptoms and premorbid status were used in the prediction formula (see Table 5). Negative symptoms were significantly related to age, \( r = -.386, p = .028 \) and did not account for any additional variability in the prediction formula.

Rehospitalization was not successfully predicted using this combination of predictor variables. The best predictors for employment-heterosexual adjustment during follow-up were premorbid status and
age, $X^2(2) = 9.75, n = 37, p = .008$. With this combination, 25 (78%) of the 37 subjects were correctly classified. This is an improvement over the prediction formula of premorbid status and RMS error (see Table 5).

Saccadic measures were not recorded during the first testing and, thus, the predictive validity of these measures could not be assessed. Given the exploratory nature of this thesis, a further discriminant analysis was computed using the predictor variables and the saccadic measures to ascertain whether the saccadic measures could potentially add anything to the prediction of the outcome. The magnitude of saccadic overshoot was found to improve the prediction of GAS scores at follow-up. The prediction formula included premorbid adjustment, negative symptoms and saccadic overshoot, $X^2(3) = 15.77, n = 37, p = .002$. Using these combined predictors 30 (81%) of the 37 subjects were correctly classified. This compares favorably to the 27 (73%) that were predicted by negative symptoms and premorbid adjustment alone. The saccadic measures were not incorporated into the prediction of rehospitalization or employment-heterosexual adjustment.

Table 9 shows the overlap between diagnosis and the good-poor adjustment dichotomy for each of the outcome measures. Individuals who received a diagnosis of schizophreniform disorder were more likely to have poor adjustment than they were to have good adjustment during follow-up. There were, however, only one third who were rehospitalized. Most individuals in the major depression group were poorly adjusted during and at the time of follow-up and were likely to be rehospitalized. Bipolar disorder patients were generally better adjusted during follow-up, as were paranoid patients.
Table 9
Diagnostic Categories Compared to Follow-up Adjustment

<table>
<thead>
<tr>
<th>Outcome Measures</th>
<th>Diagnosis</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Schizophreniform</td>
<td>Bipolar</td>
</tr>
<tr>
<td>GAS¹</td>
<td>Good</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>16</td>
</tr>
<tr>
<td>E-H Adjustment²</td>
<td>Good</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>14</td>
</tr>
<tr>
<td>Rehospitalization³</td>
<td>Good</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>7</td>
</tr>
</tbody>
</table>

¹Global Assessment Scale: Good and poor adjustment.

²Employment-heterosexual adjustment: Good and poor adjustment.

³Rehospitalization: Good = not rehospitalized during the follow-up period, poor = rehospitalized one or more times.
DISCUSSION

Summary of Results

The results from this study indicate that the interview data were reliably collected and the ratings that were based on interview data were reliably made. The measure of smooth pursuit eye tracking integrity (RMS error) was relatively stable across nine to 18 months although the measure of phase lag was less reliable than expected. The eye tracking results were essentially the same whether the infra-red or EOG method of measurement was used. Each of the saccadic eye movement measures (latency, velocity, and accuracy) produced very similar values across left and right eyes, and leftward and rightward movements. These measures were collapsed to produce four measures of saccadic integrity (latency, average velocity, average undershoot, and average overshoot). These measures were relatively stable over the short test-retest period that was used in this assessment.

The ability of RMS error, phase lag, negative symptoms, and premorbid adjustment to predict GAS scores, employment-heterosexual adjustment, and rehospitalization was determined. GAS scores were significantly related to premorbid adjustment and phase lag. However, premorbid adjustment and negative symptoms combined to produce the best predictions of GAS scores. Employment-heterosexual adjustment during the follow up period was significantly related to premorbid adjustment and negative symptoms. The best combination of predictors for this outcome measure was premorbid adjustment and RMS error. None of the predictor variables were able to predict rehospitalization.
The degree to which RMS error and phase lag from the SPEM task, and latency, average velocity, average undershoot and average overshoot from the saccadic task could be used to predict concurrently assessed GAS scores, employment-heterosexual adjustment and rehospitalization was also determined. There were no significant relationships between the eye movement measures and the outcome measures. The combination of RMS error and saccadic overshoot approached significance in identifying GAS scores. RMS error, phase lag, and saccadic average velocity combined to identify employment-heterosexual adjustment. This combination approached but failed to reach significance. A significant relationship was found between rehospitalization and the combination of RMS error and saccadic overshoot.

Duration of the first hospitalization was significantly related to RMS error and phase lag from the first testing, GAS scores and employment-heterosexual adjustment. The age of the patients at the time of their first hospitalization was significantly related to negative symptoms, premorbid adjustment, GAS scores, and phase lag from the first testing. Age, combined with premorbid adjustment, proved to be a relatively powerful predictor of GAS and employment-heterosexual adjustment. The saccadic measures were included in the prediction analysis to determine if these measures could potentially predict outcome. The prediction of GAS scores was enhanced by adding saccadic overshoot to the combination of premorbid status and negative symptoms. There was considerable overlap between the diagnosed disorders for each of the outcome measures used. Schizophrenics tended to be poorly adjusted as
did depressed patients. Bipolar and paranoid patients were likely to be better adjusted.

Predictors of Outcome

The results from this study were successful in identifying two subgroups of psychotic patients. These groups were identified by the level of adjustment attained nine to 18 months after their first psychotic episode. Poor premorbid adjustment, negative symptoms and deviant smooth pursuit eye-tracking tended to occur in subjects who had poor adjustment during the follow-up period. These patients were likely to be young and to have longer than average hospitalization periods. Well adjusted patients were generally older, with shorter periods of hospitalization, better premorbid adjustment, fewer negative symptoms and better smooth pursuit eye tracking.

The association between age at the first hospitalization, longer duration of hospitalization, a preponderance of negative symptoms and slow recovery has been reported in other studies (see Seidman, 1983, for a review). These aspects of psychosis, together with poor premorbid adjustment, have been associated with neurological impairment (Seidman, 1983) and may reflect a subgroup with neurological involvement within the present patient sample. This hypothesis needs to be investigated further using a measure of neuropathology.

Premorbid Adjustment. The strongest single predictor of adjustment after a psychotic episode was level of premorbid adjustment. The findings from this study concur with those of Schnell (1964) in finding a positive relationship between the Phillips Premorbid Adjustment Scale
(PPAS) and later employment-heterosexual adjustment. The PPAS was also found to be related to GAS score for the month of the follow-up interview. However, duration of hospitalization and subsequent hospitalization were not related to PPAS scores. This finding was in agreement with that of Strauss and Carpenter (1977).

**Negative Symptoms.** Significant relationships between negative symptoms and later employment-heterosexual adjustment indicate that negative symptoms are potentially useful in predicting adjustment. The ability of negative symptoms together with premorbid adjustment to predict poor outcome supports this position and is in agreement with the findings of Andreasen and Olsen (1982). It is also interesting to note that negative symptoms tended to occur in younger rather than older patients. Together the findings regarding negative symptoms support the position of Crow (1980) who argued that negative symptoms tended to be associated with early onset, poor premorbid status and chronic course. The significant relationship between negative symptoms and RMS error (whether estimated from the first or follow-up testing) further attests to the stability of the eye-tracking measure and suggests that negative symptoms and disrupted eye-tracking may reflect a common, stable underlying phenomenon. To my knowledge this relationship between RMS error and negative symptoms has not been previously reported and therefore needs to be replicated.

**Smooth Pursuit Eye Movements.** RMS error, at the time of the first testing, combined with premorbid status to predict GAS scores at follow-up. This finding suggests that disrupted smooth pursuit eye-
tracking may be a useful adjunct in the prediction of future adjustment in psychotic patients. Phase lag, too, appears to account for some variability in the prediction of adjustment in psychotic patients. However, phase lag was highly related to RMS error and appears not to explain any unique variance in the prediction of the outcome measures used in this study. The moderately high test-retest reliability of eye-tracking performance (RMS error) replicates the finding of Iacono and Lykken (1979, 1981) and indicates that this measure is stable.

**Exploratory Measures.** Since the saccadic measures were taken concurrently with the outcome measures, their predictive value could not be assessed directly. The inclusion of saccadic overshoot in the prediction of GAS scores indicates that overshoot may be useful in the prediction of adjustment. This finding needs to be replicated.

Duration of the first hospitalization was found to be significantly related to a number of predictor and outcome measures, but did not account for any variance over that of the predictor variables in the discriminant analyses. Nevertheless, duration of hospitalization is strongly related to GAS scores and employment-heterosexual adjustment. One explanation that cannot be ruled out with the present evidence derives from the fact that social factors may play a role in the decisions to admit or release an individual from hospital. Further research is needed to assess this variable.

The predictors, in this study, were successful in distinguishing two groups that differed with regard to outcome (GAS scores and employment-heterosexual adjustment at follow-up). These outcomes are,
however, limited in scope. As Kokes et al (1977) noted, prognosis is multidimensional and a number of dimensions must be taken into account if prediction of outcome is to be accurate. Thus, while the present findings look promising, further outcome measures must be incorporated to extend the present research. Rehospitalization was not useful in distinguishing two subgroups that were independent on the predictor measures used. Further research is needed to isolate the factors that can be used to predict rehospitalization. Recent research on expressed emotion in families of schizophrenics (Miklowitz, Goldstein & Falloon, 1983) indicated that the family environment may be significant in occurrence of rehospitalization. This factor needs to be investigated further in the present sample.

Summary of Discussion

In summary, the present study has achieved some success in defining subgroups that are based on the interrelationship or clustering among variables within a subgroup and a degree of nonrelationship or independence between subgroups. The subgroups appear to have implications for short-term adjustment. Necessarily, this study was, to some extent, exploratory. The findings must be replicated before confident conclusions can be made. Nevertheless, this diagnostically heterogeneous group of patients appears to form at least two relatively distinct groups. These groups do not coincide with any of the diagnostic categories used. One group is generally younger and is distinguished by a tendency towards poor premorbid adjustment, negative symptoms, deviant smooth pursuit eye-tracking, and longer hospitalization. The second
group is more likely to have good premorbid adjustment, few negative symptoms, good smooth pursuit eye-tracking, shorter periods of hospitalization and is more usual in older patients. Individuals in this group were likely to be well adjusted nine to 18 months after their first psychotic episode. Individuals in the first group were likely to have poor adjustment after their first psychotic episode. This subgroup appears to correspond to the process distinction (Crow, 1980, Garmezy & Rodnick, 19659, Weinberger et al., 1982; Seidman, 1983) with poor premorbid status, poor heterosexual adjustment and poor prognosis. Further research is needed to determine whether this subgroup is also associated with neuropathology as was reported by Crow (1980) and Weinberger (1982), and to obtain measures of adjustment after longer follow-up periods.
REFERENCES


APPENDIX A

SCREENING SCHEDULE

WHO COLLABORATIVE STUDY
ON DETERMINANTS OF OUTCOME
OF SEVERE MENTAL DISORDER

Name of Facility: _____________________________

Person who made this assessment:

Name: _____________________________________

Position: ________________________________

Patient's research number (to be completed by research team)  

Date when this form was filled in: __________  __________  __________

Sex of patient (1 = male; 2 = female)  

Ring as Appropriate

A. 1) Is this patient's age below 15 or above 54?  
    No  Yes

   2) Does this patient at present live outside the catchment area defined for the study?  
    No  Yes

B. Is there evidence that this patient has any of the following problems: (see guidelines)

   1) Clinically manifest organic cerebral disorder
      (e.g. infectious, parasitic, toxic, cerebrovascular; epilepsy; brain injury, etc.)  
      No  Yes

   2) Severe mental retardation (i.e. IQ less than 50, or clinically manifest as such)  
      No  Yes

   3) Severe alcohol dependence manifest in:
      Presence of marked withdrawal symptoms  
      No  Yes
Presence of alcohol encephalopathy or Korsakov's psychosis

No  Yes

History of acute alcohol psychosis (delirium tremens or hallucinosis) within the last year

No  Yes

4) Demonstrable dependence on either:

i) opium or derivatives; or

No  Yes

ii) barbiturates

C. During the past one year has the patient presented any of the following?

1) Hallucinations or pseudohallucinations in any modality

No  Yes

2) Delusions

No  Yes

3) Marked thought and speech disorder (e.g. incoherence, irrelevance, thought blocking, neologisms, incomprehensibility of speech) other than simple retardation or acceleration

No  Yes

4) Marked psychomotor disorder (e.g. negativism, mutism or stupor; catatonic excitement; constrained attitudes or unnatural postures maintained for long periods) other than simple retardation or acceleration

No  Yes

5) Emergence or marked exacerbation of bizarre and grossly inappropriate behavior (e.g. talking or giggling to self, acts incomprehensible to others, loss of social constraints, etc.)

No  Yes

D. During the past one year, has the patient presented a definite change of personality and behaviour manifested in any of the following?

1) Marked reduction or loss of interests, initiative and drive, leading to serious deterioration of the performance of usual activities and tasks

No  Yes

2) Emergence of marked exacerbation of social withdrawal (active avoidance of communication with other people)

No  Yes

3) Severe excitement, purposeless destructiveness or aggression

No  Yes
4) Episodic or persistent states of overwhelming fear or severe anxiety
   No Yes

5) Gross and persistent self-neglect
   No Yes

E. Has this patient been admitted to any hospital, or otherwise diagnosed or treated for psychotic disorder, similar to, or continous with the present illness, at any time before the current contact or spell of treatment for psychiatric disorder? (Do not consider contacts for minor problems long ago, like attendance of a child guidance clinic for conduct or emotional disorder, etc.)
   No Yes

F. Diagnoses of patient made at the facility.

G. Conditions for inclusion in the study:
   1) All replies to questions in sections A, B1, and B2 and E must be "no" and there should be at least one "yes" in section C or two "yes" in section D

   OR

   2) If the patient does not meet the criteria specified under 1) the patient may still be included if the rater has other reasons to believe that he/she may be suffering from a schizophrenic disorder. Such reasons should be specified below:

      Other reasons for inclusion

TO BE COMPLETED BY RESEARCH TEAM:

CONCLUSION: This patient is INCLUDED (ring as appropriate) EXCLUDED
Guidelines for Use of the Screening Schedule

General

The Screening Schedule should be filled in by a psychiatrist or by another investigator with relevant experience qualifying him to apply reliably the screening criteria. Any user of the schedule, whether a member of the project team or not, should be given brief, but adequate training in the use of the instrument. The chief investigator should check the adequacy of such training by discussion and by a joint screening exercise on a few cases.

The Screening Schedule will be filled in on the basis of information from: (i) a brief interview with the patient, (ii) a brief interview with an informant, (iii) admission or outpatient notes, (iv) any combination of these. Considering the limited access to some kinds of information at the screening stage, the investigator should preferably err on the overinclusive side and not exclude cases which raise doubts or cannot be adequately assessed with the screening criteria. Such patients can be excluded, if necessary, after a more detailed assessment with the PSE and the Psychiatric History Schedule.

Organic cerebral disorder is considered to be present if there is clear evidence at the time of examination or in the last three months of any of the following: (i) marked disturbances of memory, (ii) episodes of clouding of consciousness or confusion manifested in impaired orientation in place and/or time, (iii) focal symptoms like aphasia. Organic cerebral disorder is also considered present if in the last one year there was: (i) a history of head injury followed by coma lasting for eight hours or more, or by post-traumatic amnesia lasting for 72 hours or more, (ii) two or more epileptic fits, or evidence that the patient has been on anti-convulsant medication for more than six months.

Severe alcohol dependence is presumed to be present if with regard to the last 12 months there is evidence of excessive alcohol intake and any of the following: (i) withdrawal symptoms (tremor, sweating, palpitations, insomnia, irritability) on cessation of drinking, (ii) history of alcohol psychosis in last year, (iii) symptoms of alcohol encephalopathy or polyneuritis. Caution should be exercised in cases of suspected alcohol hallucinosis accompanied by clear consciousness: such patients should be provisionally included.

The diagnosis to be entered is the one made at the facility prior to the assessment of the patient by the project team. The project diagnosis made after the assessment should be recorded on the Present State Examination (PSE).
APPENDIX B
FOLLOW-UP QUESTIONNAIRE

Background Data

Patient's ID Number: ____________________________

Date signed consent form. Month: ___ Day: ___ Year: ___

Date discharged from first-break hospitalization: Month: ___ Day: ___ Year: ___

Number of months on which follow-up interview questions are based: __________________________

Date from which follow-up is based: Month: ___ Day: ___ Year: ___

Note: This is the beginning follow-up date, and should be same as the date the person was released from hospital. If the person was not hospitalized, this date should be the same as the date the person signed the consent form.

Date social data collection completed. Month: ___ Day: ___ Year: ___

Follow-Up Interview Data

Date: ______________ Time Started: ______________ Time Ended: ______________

Primary Interviewer: ____________________________

Secondary Interviewer: ____________________________

Introduction

As I guess you know, we're seeing you again to find out how things have been going with you, and what kinds of things have been happening. So I'll be asking you some questions about how you've been feeling, and how you're spending your time. The main reason for this study is so that we can help people like yourself in the future. All the information you give me will be confidential.

1. Are you receiving treatment at the present time?

   Yes ___ [FILL OUT HEALTH SUMMARY TABLE BELOW]
   No ___ [GO TO QUESTION 2]

A. Current treatment

   1. Agency or type of health professional: ____________________________
   2. Location: ____________________________
   3. Treatment from _____________ to _____________ . Length: _____________
   4. Reasons: ____________________________
      ____________________________
      ____________________________
   5. Nature of treatment: ____________________________
6. Medications. [COMPLETE TABLE BELOW OR CHECK TO SEE IF THERE HAVE BEEN ANY CHANGES SINCE TELEPHONE CONTACT. IF NO MEDICATION, RECORD LENGTH OF DRUG-FREE PERIOD.]

a) Current Medications:

<table>
<thead>
<tr>
<th>Name</th>
<th>Dose</th>
<th>Frequency</th>
<th>Date began prescription</th>
</tr>
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</tbody>
</table>

b) Medications terminated during the last month:

<table>
<thead>
<tr>
<th>Name</th>
<th>Dose</th>
<th>Frequency</th>
<th>Date began-Date ended</th>
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</table>


c) People have different attitudes toward taking medication. In the last month, what percentage of the time have you taken the medications as prescribed?

Percentage of time: ______________________

2. Since (beginning follow-up date) have you been hospitalized or seen a doctor or any other health professional for emotional problems (other than those you have just described)?

   Yes [FILL OUT HEALTH-TREATMENT SUMMARY TABLE BELOW]
   No [GO TO QUESTION B]

A. Prior treatments

i) Treatment One:

1. Agency or type of health professional: ______________________
2. Location: ______________________
3. Treatment from ____________ to ______________. Length: ______
4. Reasons: ______________________
   ______________________
   ______________________
5. Nature of treatment: ______________________

ii) Treatment Two

1. Agency or type of health professional: ______________________
2. Location: 

3. Treatment from ___________ to ___________. Length:__________

4. Reasons:________________________________________________________________

__________________________________________________________________________

iii) Treatment Three
1. Agency or therapist: ________________________________

2. Location: _____________________________________________________________________

3. Treatment from ___________ to ___________. Length:__________

4. Reasons:_____________________________________________________________________

____________________________________________________________________________

5. Nature of treatment: _________________________________________________________

B. Have you ever received electroconvulsive therapy?

Yes__ When? ______________________

No ___

C. Involvement in Social Programs

1. Since (beginning follow-up date), have you participated in any groups for social purposes such as one run by a community care teams?

   Yes__ [IF YES, COMPLETE ACTIVITIES SUMMARY TABLE]
   No ___

2. Since (beginning follow-up date), have you taken any job training courses or life skills classes? For example, assertiveness training, stress management, parenting classes, yoga.

   Yes__ [IF YES, COMPLETE ACTIVITIES SUMMARY TABLE]
   No ___

3. Since (beginning follow-up date), have your family taken any counselling or joined any mental health associations?

   Yes__ [IF YES, COMPLETE ACTIVITIES SUMMARY TABLE]
   No ___

i) Activity One

1. Agency or type of health professional: ________________________________

2. Location: _____________________________________________________________________

3. Treatment from ___________ to ___________. Length:__________
4. **Reasons:** __________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

5. **Nature of program:** __________________________________________________________________________________________

ii) **Activity Two**

1. **Agency or type of health professional:** __________________________________________________________________________________________

2. **Location:** __________________________________________________________________________________________

3. **Treatment from** ________ **to** ________ **. Length:** ______

4. **Reasons:** __________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

5. **Nature of program:** __________________________________________________________________________________________

iii) **Activity Three**

1. **Agency or type of health professional:** __________________________________________________________________________________________

2. **Location:** __________________________________________________________________________________________

3. **Treatment from** ________ **to** ________ **. Length:** ______

4. **Reasons:** __________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

5. **Nature of program:** __________________________________________________________________________________________

iv) **Activity Four**

1. **Agency or type of health professional:** __________________________________________________________________________________________

2. **Location:** __________________________________________________________________________________________

3. **Treatment from** ________ **to** ________ **. Length:** ______

4. **Reasons:** __________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
5. Nature of program: 

3. What have your drinking habits been like since we last saw you? [NOTE FREQUENCY AND QUANTITY].

4. How much have you been drinking in an average week over the last month?

<table>
<thead>
<tr>
<th>Type</th>
<th>Quantity</th>
<th>Frequency</th>
<th>Date of Last Use</th>
</tr>
</thead>
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5. A. During the last month, have you taken anything on your own for sleeping, or your mood, or to get high -- like Dextedrine, Seconal or some other barbiturate.

B. How about marijuana, narcotics, LSD or things like that?

C. Have you used anything else to get high, lose weight, or stay awake?

<table>
<thead>
<tr>
<th>Type</th>
<th>Quantity</th>
<th>Frequency</th>
<th>Date of Last Use</th>
</tr>
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DEPRESSION

I would like to get an idea of any things that might have been bothering you during the past month.

6. During the last month have you felt sad, blue, depressed or lost all interest and pleasure in things that you usually cared about or enjoyed?

   Yes [ASK a & b]  5
   No  1

   a. For how long did this depressed [OR Ss EQUIVALENT] feeling last? 
   b. Are you feeling depressed now? Yes  No

7. During the last month, has there been a time when you lost your appetite?

   Yes [ASK a & b AND PROBE QUESTIONS]  1 3 4 5
   No  

   a. For how long did this appetite loss last? 
   b. Have you had an appetite for the last 2 or 3 days? Yes  No
8. Have you lost any weight without trying to within the last month?
   Yes [ASK a & b AND PROBE QUESTIONS] 1 3 4 5
   No  
   a. How much weight did you lose? 
   b. Are you still losing weight? Yes No 

9. Has your eating increased so much that you have gained weight in the past month?
   Yes [ASK a & b AND PROBE QUESTIONS] 1 3 4 5
   No  
   a. How much weight have you gained? 
   b. Are you still gaining weight? Yes No 

10. Have you had any trouble falling asleep, staying asleep or waking up too early in the past month?
    Yes [ASK a & b AND PROBE QUESTIONS] 1 3 4 5
    No  
    a. For how long did you have trouble falling asleep last? 
    b. Are you still having trouble falling asleep? Yes No 

11. Have you been sleeping too much during the past month?
    Yes [ASK a & b AND PROBE QUESTIONS] 1 3 4 5
    No  
    a. For how long were you sleeping too much? 
    b. Are you still sleeping too much? Yes No 

12. Has there been a period during the past month when you felt tired out all the time?
    Yes [ASK a & b AND PROBE QUESTIONS] 1 3 4 5
    No  
    a. For how long did you feel tired out all the time? 
    b. Are you still feeling tired out? Yes No 

13. Has there been a period during the past month when you talked or moved more slowly than is normal for you?
    Yes [ASK a & b AND PROBE QUESTIONS] 1 3 4 5
    No  
    a. For how long did you move more slowly? 
    b. Are you still moving more slowly than is normal for you? Yes No 

14. Has there been a period during the past month when you had to be moving all the time -- that is, you couldn't sit still and paced up and down?
    Yes [ASK a & b AND PROBE QUESTIONS] 1 3 4 5
    No  
73

a. For how long did you feel that you had to be moving all the time? 

b. Do you still feeling that you have to keep moving? Yes No

15. Has there been a period during the past month when your interest in sex was a lot less than usual?

Yes [ASK a & b AND PROBE USING "decreased interest in sex"] 1 2 3 4 5 6 

No 

a. How long did this decreased interest in sex last? 

b. Do you still have less interest in sex than usual? Yes No

16. Has there been a period during the past month when you felt worthless, sinful or guilty?

Yes [ASK a & b] 5 

No 1 

a. How long did this feeling of worthlessness last? 

b. Are you still feeling worthless? Yes No

17. Has there been a period during the past month when you had a lot more trouble concentrating than is normal for you?

Yes [ASK a & b AND PROBE QUESTIONS] 1 3 4 5 

No 

a. For how long did you have trouble concentrating? 

b. Are you still having trouble concentrating? Yes No

18. Has there been a period during the past month when your thoughts came much slower than usual or seemed mixed up?

Yes [ASK a & b AND PROBE QUESTIONS] 1 3 4 5 

No 

a. For how long did your thoughts come slower than usual? 

b. Are your thoughts still coming slower than usual? Yes No

19. Has there been a period, during the past month, when you thought a lot about death -- either your own, someone else's, or death in general?

Yes [ASK a & b] 5 

No 1 

a. How long did these thoughts about death last? 

b. Are you still having these thoughts about death? Yes No

20. Has there been a period, during the past month, when you felt like you wanted to die?

Yes [ASK a & b] 5 

No 1 

a. How long did you feel like you wanted to die? 

b. Are you still feeling like you want to die? Yes No
21. Has there been a period in the past month when you felt so low you thought of committing suicide?

Yes____ [ASK a & b] 5
No____ 1

a. For how long did you think of committing suicide? ______________________
b. Are you still thinking of committing suicide? Yes____ No____

22. Have you attempted suicide in the past month?

Yes____ 5
No____ 1

22a. (ASK A. IF DEPRESSION IS DENIED AND SOME OF THE DEPRESSION ITEMS ARE ANSWERED IN THE POSITIVE)

A. When you were having some of these problems (LIST Sx CODED 5 IN QUESTIONS 7-22), at the same time were you feeling okay, or were you feeling low, gloomy, blue, or uninterested in everything?

Okay____
Gloomy, low, etc.____ (CODE ITEM 6, 5 AND ASK 6a AND 6b)

ANXIETY

23. During the past month, has there been a period of a day or more when you felt nervous or were trembling, jittery, shaky, restless, tense, or uptight most of the time?

Yes____ [ASK a. & b. AND PROBE QUESTIONS] 1 3 4 5
No____

a. How long did you feel nervous [OR Ss EQUIVALENT]? ______________________
b. Are you still feeling nervous? Yes____ No____

24. During the past month, has there been a period of a day or more when you worried much of the time about things that might happen?

Yes____ [ASK a. & b. AND PROBE QUESTIONS] 1 3 4 5
No____

a. For how long did you worry much of the time? ______________________
b. Are you still worrying much of the time? Yes____ No____

25. During the past month, has there been a period when you were bothered by sweating, dizziness, shortness of breath or pounding heart?

Yes____ [ASK a. & b. AND PROBE QUESTIONS] 1 3 4 5
No____

a. How long did [List Sx REPORTED] last? ______________________
b. Are you still experiencing [Sx]? Yes____ No____
26. During the past month, has there been a period of a day or more when you felt on edge, irritable or impatient much of the time?

Yes___ [ASK a. & b. AND PROBE QUESTIONS] 1 3 4 5  
No___  

a. How long did [List Sx REPORTED] last?  
b. Are you still feeling [Sx] way? Yes___ No___

27. Has there been a period, during the past month, when you were so happy or excited, or high that you got into trouble, or your family or friends worried about it, or a doctor said you were manic?

Yes___ [ASK a & b AND PROBE QUESTIONS] 1 3 5  
No___  

a. For how long did you feel happy and excited?  
b. Are you feeling happy and excited? Yes___ No___

28. Has there been a period in the past month when you were so much more active than usual that you or your family or friends were concerned about it?

Yes___ [ASK a & b AND PROBE QUESTIONS] 1 3 5  
No___  

a. For how long were you more active than usual?  
b. Are you still more active than usual? Yes___ No___

29. Has there been a period in the past month when you went on spending sprees -- spending so much money that it caused you or your family some financial trouble?

Yes___ [ASK a & b AND PROBE QUESTIONS] 1 3 5  
No___  

a. For how long did this spending spree last?  
b. Have you been going on spending sprees in the last few days? Yes___ No___

30. Has there been a period in the past month when your interest in sex was so much stronger than is typical for you that you wanted to have sex a lot more frequently than is normal for you or with people you wouldn't normally be interested in?

Yes___ [ASK a & b AND PROBE QUESTIONS] 1 3 5  
No___  

a. For how long did you have an increased interest in sex?  
b. Do you have an increased interest in sex at the present time? Yes___ No___

31. Has there been a period in the past month when you talked so fast that people said they couldn't understand you?

Yes___ [ASK a & b AND PROBE QUESTIONS] 1 3 5  
No___  

MANIA
32. Has there been a period in the last month when your thoughts raced through your head so fast that you couldn't keep track of them?

Yes____ [ASK a & b AND PROBE QUESTIONS]  1 3 5
No____

a. For how long did your thoughts race?

b. Have your thoughts raced in the last day or two? Yes____ No____

33. Has there been a period in the past month when you felt you had a special gift or special powers to do things others couldn't do, or that you were a specially important person? (Refers to supernatural powers)

Yes____ ASK FOR AN EXAMPLE BEFORE PROBING?

[ASK a & b AND PROBE QUESTIONS]

No____  1 3 5

a. How long did you feel that you had a special gift or special powers?

b. Do you feel that you have special gifts or powers now? Yes____ No____

34. Has there been a period in the past month when you hardly slept but still didn't feel tired or sleepy?

Yes____ [ASK a & b AND PROBE QUESTIONS]  1 3 5
No____

a. For how long did you sleep very little?

b. Do you still sleep very little? Yes____ No____

35. Has there been a period in the past month when you were easily distracted so that any little interruption could get you off the track?

Yes____ [ASK a & b AND PROBE QUESTIONS]  1 3 5
No____

a. For how long were you easily distracted?

b. Are you still easily distracted? Yes____ No____

SCHIZOPHRENIA

CODE: 1 = no  4 = med. exp.
2 = below crit.  5 = yes
3 = drugs or alc.

INTERVIEWER: FOR QUESTIONS 38-45 ASK FOR AN EXAMPLE BEFORE PROBING.
*DO NOT USE EXAMPLES IN PROBING. DO USE UNDERLINED WORDS.
36. Now I want to ask about some ideas you might have had about other people.
During the past month, did you believe people were watching you or spying on you? [IF YES ASK a. AND PROBE QUESTIONS]

Ex: _________________________________________________________________* 1 2 3 4 5 6
MD: ___________________________ SELF: _______________________________

IF QUALIFIES AS 5, BUT PLAUSIBLE OR JUST SELF-CONSCIOUS, CODE 6.
a. Do you still feel people are watching you? Yes____ No____

37. During the past month was there a time when you believed people were following you? [IF YES ASK a. AND PROBE QUESTIONS]

Ex: _________________________________________________________________* 1 2 3 4 5 6
MD: ___________________________ SELF: _______________________________

IF QUALIFIES AS 5, BUT PLAUSIBLE CODE 6.
a. Do you still feel people are following you? Yes____ No____

38. During the past month did you feel that someone was plotting against you or trying to hurt you or poison you? [IF YES ASK a. AND PROBE QUESTIONS]

Ex: _________________________________________________________________* 1 2 3 4 5 6
MD: ___________________________ SELF: _______________________________

IF QUALIFIES AS 5, BUT PLAUSIBLE, CODE 6.
a. Do you still feel someone is plotting against you or trying to hurt you? Yes____ No____

39. During the past month did you feel that someone was reading your mind?
INTERVIEWER: IF NO, CODE 1. ALL OTHERS ASK A.

A. Did they actually know what you thought or were they just guessing from the look on your face or from knowing you for a long time? [IF "KNOW" ASK a. AND PROBE QUESTIONS]

INTERVIEWER: IF "JUST GUESS", CODE 1. OTHERS ASK FOR AN EXAMPLE AND BEGIN PROBING.

Ex: _________________________________________________________________* 1 2 3 4 5
MD: ___________________________ SELF: _______________________________

a. Do you still feel someone is reading your mind? Yes____ No____
40. During the past month have you felt that you could actually hear what another person was thinking, even though he was not speaking, or believed that others could hear your thoughts? [IF YES ASK a. AND PROBE QUESTIONS]

Ex: ________________________________________________________________ * 1 2 3 4 5

MD: ___________________________ SELF: ___________________________

a. Do you still feel that you can hear that others are thinking or that others can hear your thoughts? Yes  No

41. During the past month, did you think that others were controlling how you moved or what you thought, against your will? [IF YES ASK a. AND PROBE QUESTIONS]

Ex: ________________________________________________________________ * 1 2 3 4 5

MD: ___________________________ SELF: ___________________________

a. Do you still think others are controlling how you move or what you think? Yes  No

42. During the past month did you feel that someone or something could put strange thoughts directly into your mind or could take or steal your thoughts out of your mind? [IF YES ASK a. AND PROBE QUESTIONS]

Ex: ________________________________________________________________ * 1 2 3 4 5

MD: ___________________________ SELF: ___________________________

a. Do you still feel that others can put in or remove strange thoughts from your mind? Yes  No

43. During the past month have you felt that you were being sent special messages through television or the radio? [IF YES ASK a. AND PROBE QUESTIONS]

Ex: ________________________________________________________________ * 1 2 3 4 5

MD: ___________________________ SELF: ___________________________

a. Do you still feel that you are being sent special messages through the television or radio? Yes  No

44. INTERVIEWER: RECORD ANY VOLUNTEERED DELUSIONS NOT CODEABLE IN 0. 39-46. DO NOT ASK. [IF ANY VOLUNTEERED ASK a. AND PROBE QUESTIONS]

IF NONE, CODE 1.
IF ANY, DESCRIBE.

______________________________________________________________________

MD: ___________________________ SELF: ___________________________

a. Do you still feel [Sx] is the case? Yes  No
45. During the past month have you had the experience of seeing something or someone that others who were present could not see—that is, had a vision when you were completely awake? [IF YES ASK a. and, b., AND PROBE QUESTIONS]

a. What did you see? RECORD BELOW AND THEN BEGIN PROBING.

__________________________________________________________

MD: ______________________ SELF: __________________________

1 2 3 4 5

b. Have you had the experience of seeing something or someone that others who were present could not see in the last day or two? Yes ____ No ____

46. During the past month have you more than once had the experience of hearing things other people couldn't hear, such as a voice? [IF YES ASK a. AND PROBE QUESTIONS]

a. What did you hear? RECORD BELOW AND THEN BEGIN PROBING.

__________________________________________________________

MD: ______________________ SELF: __________________________

1 2 3 4 5

b. Did you hear voices commenting on what you were doing or thinking?

No 1

Yes 5

c. Did you hear two or more voices talking to each other?

No 1

Yes 5

d. Have you heard these things in the past day or two? Yes ____ No ____

47. During the past month have you been bothered by strange smells around you that nobody else seemed to be able to smell, perhaps even odors coming from your own body? [IF YES ASK a. & b. AND PROBE QUESTIONS]

a. What did you smell? RECORD BELOW AND THEN BEGIN PROBING.

__________________________________________________________

MD: ______________________ SELF: __________________________

1 2 3 4 5

b. Have you noticed these smells in the past day or two? Yes ____ No ____
48. During the past month have you had unusual feelings inside or on your body—like being touched when nothing was there or feeling something moving inside your body? [IF YES ASK a & b AND PROBE QUESTIONS]

INTERVIEWER: IF NO: CODE 1. ALL OTHERS ASK A

a. What did you feel? RECORD BELOW AND THEN BEGIN PROBING.

__________________________________________________________________________

MD: __________________________ SELF: ___________________________

* 1 2 3 4 5

b. Have you had unusual feelings inside or on your body in the last day or two?  
Yes No

INTERVIEWER: ASK 49-51 IF ANY 5s ARE RECORDED IN Qs 36-48.

49. At the time you had these beliefs or experiences [LIST Sx. CODED 5 IN Qs. 36-48] were you your normal self, or were you feeling nervous, upset, unable to work, unable to go places or unable to enjoy yourself?

Normal self 1  
Not normal [ASK a] 5

a. For how long did you feel nervous, upset, unable to work or unable to enjoy yourself? ____________

b. Are you feeling nervous, upset, unable to work or enjoy yourself now?  
Yes No

[IF YES SKIP TO 52, IF NO ASK 50-51.]

50. After you had these beliefs or experiences, did you find that you were less able to do your work well?

No effect 1  
Less able 5

51. After you had these beliefs or experiences (LIST Sx CODED 5 IN Qs 36-48), were you less able to enjoy social relationships with other people?

No 1  
Yes 5

INTERVIEWER: CODE O52 WITHOUT ASKING

52. Blunted affect (expressionless face and voice, uniform blunting whatever the topic of conversation, indifference to distressing topics, whether delusional or normal.

No blunted affect 0
Blunting not uniform, e.g., at times responds affectively but at other times is markedly flat; or responds with some evidence of affect, but definitely less than expected 1
Severe and uniform blunting 2
53a. During the last month have you been working (including working as a housewife) or going to school?

Yes [COMPLETE TABLE BELOW, BE SPECIFIC]  
No [SKIP TO QUESTION 53C]

<table>
<thead>
<tr>
<th>nature of job/school</th>
<th>% of full time</th>
<th>date began</th>
<th>date ended</th>
<th>why ended</th>
</tr>
</thead>
</table>

B. Would you say your (work/school performance) during the last month has been above average, average, or below average compared to others who (have the same job/follow the same course of study)?

above average _____  
average _____  
below average _____

C. For how many of the __ months since (beginning follow-up date) were you not working and not in school?

months _____

D. For how much of that time were you looking for work but were not able to find a job?

months _____  
Is that the situation now? yes _____  
no _____

E. For how much of that time were you not looking for work because of emotional or mental problems or because of problems with drugs and alcohol?

months _____  
Is that the situation now? yes _____  
no _____

F. How much time (besides that) were you just not interested in working?

months _____  
Is that the situation now? yes _____  
no _____

54A. How many hours in an average week during the last month did you spend socializing with other people? By socializing, I mean talking with them, phoning them, or doing something together. This means more than just sitting in the same room.

hours _____
B. In an average week during the last month, how many different times did you socialize with other people? By socialize, I mean talking with other people, phoning them, or doing something together.

number of times

C. How many different people do you socialize with in an average week? By socialize, I mean talking with other people, phoning them, or doing something together.

number of people

D. Is there a TV available for you to watch?

Yes [ASK QUESTION i BELOW]

No

i) In an average day during the last month, how many hours did you spend watching TV?

hours

E. During the last month, how many hours in an average week did you spend doing leisure time activities or hobbies by yourself? Don't include time you spent watching TV. Do include things like going on walks, jogging, cycling, reading, swimming or working on a hobby or project.

hours

55. With whom are you living now? [FOR EACH PERSON, INQUIRE ABOUT AGE, SEX, RELATIONSHIP TO PATIENT.]

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Sex</th>
<th>Age</th>
<th>Length of living arrangement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
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<td>2.</td>
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<td>5.</td>
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</tbody>
</table>

If living alone, indicate for how long:

56. In the ___ months since (beginning follow-up date), have any of the events on this list happen to you.

What effect did (event) have on you? [GIVE ATTACHED SCALE TO INTERVIEWEE AND OBTAIN A RATING FOR EACH EVENT CHOSEN]

57. For many people, stressful events can cause emotional problems. I would like to see if any of the things on this list happened to you in the year before you were hospitalized/came to ________________.

What effect did (event) have on you? [OBTAIN A RATING FOR EACH ITEM CHOSEN]
LIFE EXPERIENCES

Marriage

Engagement

Divorce

Arrested

Physical illness or injury to yourself

Death of relative or friend

Serious illness or injury of relative or friend

Problems with relatives or friends

Foreclosure on mortgage or loan

Outstanding personal achievement

Pregnancy or wife-girlfriend pregnant

Gaining a new family member

Major change in eating or sleeping habits

Sexual problems

Abortion or wife-girlfriend had abortion

New job or change in work situation

Problems at work

Change in spouse's or boyfriend/girlfriend's job

Change in financial status

Change of residence

Change in recreational activity

Change in church activities

Separation from spouse or boy/girlfriend

Getting back together with spouse or boy/girlfriend

Borrowing money

Laid off, fired, or quit job

Completed or dropped out of school

Son or daughter leaving home
58. Now I would like to ask you about your life as a teenager.

Did you belong to any groups, clubs, organizations, or athletic teams, including school organizations, while you were a teenager?

Yes [ask i]
No [ask iv]

i) What type of organization or group did you belong to?

How long were you a member?

Did you hold an office or position of leadership in (any of) the group(s)?

Yes [ask ii]
No [ask iii]

ii) What position(s) did you hold?

How long did you hold this/these position(s)?

[iF SUBJECT HELD A LEADERSHIP POSITION, CODE "A" AND GO TO QUESTION 59]

iii) Would you describe yourself as an active and interested member or were you not very active in (this/any of these) organization(s)?

Active/interested
Not active

iv. While you were a teenager, did you belong to a group of friends who did things together?

Yes [ASK v]
No [ASK vi]

v) Would you describe yourself as an active and interested member?

Yes
No
vi) Did you have any close friends while you were a teenager? [ALLOW SUBJECTS TO USE THEIR OWN DEFINITION OF CLOSE FRIEND]

Yes [ask vii]
No [ask viii]

vii) When you were a teenager, how many close friends did you have?

How many of these people were friends you could really trust or count on?

viii) Would you describe yourself as generally preferring to be by yourself during your teenage years or did you prefer to be with other people?

With others
Alone

ix) Did you prefer to be alone in the years before your teens?

Yes
No

Circle correct code letter

(A) A leader or officer in formally designated groups, clubs, organizations, or athletic teams in senior high school, vocational school, college, or in young adulthood.

(B) An active and interested participant, but did not play a leading role in groups of friends, clubs, organizations, or athletic teams in senior high school, vocational school, college, or in young adulthood.

(C) A nominal member, but had no involvement in, or commitment to, groups of friends, clubs, organizations, or athletic teams in senior high school, vocational school, college, or in young adulthood.

(D) From adolescence through early adulthood, had only a few casual or close friends.

(E) From adolescence through early adulthood, had no real friends, only a few superficial relationships or attachments to others.

(F) From adolescence through early adulthood (i.e., after childhood) quiet, seclusive, preferred to be by self; minimal efforts to maintain any contact at all with others.

(G) No desire to be with playmates, peers, or others, from early childhood. Either asocial or antisocial.

59. Did you date as a teenager? Yes [ask A]

No [ask B]

A. How old were you when you started dating? [GO TO QUESTION C]

B. Have you dated since then? Yes [ask A]

No
C. When you were most actively dating, how many times did you date in an average month? 

D. How old were you then?

60. Have you ever held a full-time job, including a summer job, that lasted 3 months or more? Yes [Ask A] 
No [GO TO QUESTION 62]

A. How old were you when you held your first full-time job?

61. What was the longest period of time you were employed? This time may include different jobs, as long as there is no break in between. [IF TIME SPAN COVERS MORE THAN ONE JOB, SUBJECT MUST HAVE HAD THE SECOND JOB BEFORE QUITTING THE FIRST] months_

62. In the year before we first saw you (date) were you working or going to school at least half time? 

Yes [Ask A] 
No [GO TO QUESTION 66]

A. For how many months were you a) in school: b) working:

63. Are you presently married or are you widowed, separated, divorced, or have you never been married? 

married ___ [ask A & B] 
widowed ___ [ask A] When did your husband/wife die? ___ 
separated ___ [ask A] When did you and your husband/wife separate? ___ 
divorced ___ (ask A) When did you and your husband/wife separate? ___ 
ever married ___ [skip to 69]

A. When were you married? 

B. Are you presently living with your husband/wife?

64. How many times have you been legally married? 

65. (So you've never been/ How many times have you been) divorced? 

number of times 

66. Have you ever lived with someone for at least a year as though you were married? 

Yes ___ 
No ___
67. [IF NOT MARRIED] Are you living with someone now as though you were married?

Yes _____ For how long? _______

No _____

68. [ASK IF NOT PRESENTLY LIVING WITH SPOUSE OR SPOUSE-LIKE PERSON.] Since (beginning follow-up date), have you been dating?

Yes _____ [Ask A & B]

No _____ [GO TO QUESTION 72]

A. How many times a month? _______

B. How many different people have you been dating? _______

69. How many children have you had, not counting any who are yours by adoption or who were born dead? _______

How old are they? [LIST AGES]

Do you have any adopted children? Yes __ How old are they? _______

No _______

70. Were you adopted or raised by someone other than your natural parents?

Own parents _______

Someone else _______ [ASK A AND B]

A) Who? [DESCRIBE NATURE OF RELATED PERSON] _______

B) From what age? _______
APPENDIX C

Abbreviated Form of Phillips Premorbid Adjustment Scale (Harris 1975)

A. Abbreviated Scale of Premorbid Sexual Adjustment

I. Married, presently or formerly

(1) Married, only one marriage (or remarried only one time as a consequence of death of spouse), living as a unit.

(2) Married, more than one time, maintained a home in one marriage for at least 5 years.

(3) Married and apparently permanently separated or divorced without remarriage, but maintained a home in one marriage for at least 5 years.

(4) Same as (3), but maintained a home in one marriage for less than 5 years.

II. Single (30 years or over)

(3) Has been engaged one or more times or has had a long-term relationship (at least 2 years) involving heterosexual relations or apparent evidence for a "love affair" with one person, but unable to achieve marriage.

(4) Brief or short-term heterosexual or social dating experiences with one or more partners, but no long-lasting sexual experiences with a single partner.

(5) Sexual and/or social relationships primarily with the same sex, but may have had occasional heterosexual contacts or dating experiences.

(6) Minimal sexual or social interest in either men or women.

III. Single (under 30 years)

(1) Has had at least one long-term "love affair" (minimum of 6 months to 1 year) or engagement, even though religious or other prohibitions or inhibitions may have prevented actual sexual union

(a) If ever actually engaged
(b) Otherwise

(2) Brief or short-term heterosexual or social dating experiences, "love affairs", with one or more partners, but no long-lasting sexual experiences with a single partner.
(3) Casual sexual or social relationships with persons of either sex, with no deep emotional meaning.

(4) Sexual and/or social relationships primarily with the same sex, but may have had occasional heterosexual contacts or dating experiences.

(5) Minimal sexual or social interest in either men or women.

B. Abbreviated Scale of Premorbid Social-Personal Adjustment

(0) A leader or officer in formally designated groups, clubs, organizations, or athletic teams in senior high school, vocational school, college, or in young adulthood.

(1) An active and interested participant, but did not play a leading role in groups of friends, clubs, organizations, or athletic teams in senior high school, vocational school, college, or in young adulthood.

(2) A nominal member, but had no involvement in, or commitment to, groups of friends, clubs, organizations, or athletic teams in senior high school, vocational school, college, or in young adulthood.

(3) From adolescence through early adulthood, had only a few casual or close friends.

(4) From adolescence through early adulthood, had no real friends, only a few superficial relationships or attachments to others.

(5) From adolescence through early adulthood (i.e., after childhood) quite, seclusive, preferred to be by self; minimal efforts to maintain any contact at all with others.

(6) No desire to be with playmates, peers, or others, from early childhood. Either asocial or antisocial.
APPENDIX D

Negative Symptom Ratings

PSE items 19, 20, 58, 107, 128 and 129

Thinking and Concentration

19. Can you think clearly or is there any interference with your thoughts?
   Do your thoughts tend to be muddled or slow?
   (Can you make up your mind about simple things quite easily?)
   (Make decisions about everyday matters?)
   RATE SUBJECTIVELY INEFFICIENT THINKING (if due to intrusion of alien thoughts, rate 9).
   1 = Symptom definitely present during the past month, but of moderate clinical intensity, or intense less than 50% of the time.
   2 = Symptom clinically intense more than 50% of the past month.

20. What has your concentration been like recently?
   (Can you read an article in the paper or watch a TV programme right through?)
   (Do you thoughts drift off so that you don't take things in?)
   RATE POOR CONCENTRATIONS.
   1 = Only moderate form of symptom present during the past month (e.g. can read a short article, can concentrate if tries hard); or intense less than 50% of the time.
   2 = Symptom clinically intense (cannot attempt to read or concentrate) more than 50% of the past month.
Thought Block

58. Do you ever experience your thoughts stopping quite unexpectedly so that there are none left in your mind, even when your thoughts were flowing freely before?

(What is that like?)

(How often does it occur? What is it due to?)

Do your thoughts ever seem to be taken out of your head, as though some external person or force were removing them?

(Can you give an example?)

(How do you explain it?)

RATE THOUGHT BLOCK OR WITHDRAWAL.

1 = Thought block. Do not include if due to anxiety or lack of concentration; only if it occurs totally unexpectedly when thoughts are flowing freely. One single occasion is not sufficient for rating. **Be very critical in rating this symptom.**

2 = Delusional explanation that thoughts are withdrawn.

Social Impairment

107. Of all the problems you have told me about, which one affects you most? How much does it interfere with your work or your relationships with other people?

(Have you actually been out of work, or been unable to do the housework, or go shopping, travelling, etc., during the past month?)

(Have the symptoms impaired your efficiency in any other way?)
RATE SOCIAL IMPAIRMENT DUE TO PSYCHOTIC CONDITION.

0 = No neurotic or psychotic symptoms present.

1 = Psychotic symptoms present but little diminution of subject's efficiency or interference with everyday activities.

2 = Psychotic symptoms interfere with subject's efficiency to a moderate extent but are not incapacitating, e.g. subject neglects housework or can't enjoy leisure activities or social relationships, or finds work-efficiency reduced. Subject does not, however, stop work altogether or completely neglect household.

3 = Subject severely incapacitated by psychotic symptoms: had to have at least a week off work during past month; was housebound for a week or more; was actively withdrawn from all social relationships, etc. The subject does not have to be totally incapacitated for the whole month for this rating to be made, but impairment has to be very severe.

8 = Examiner unsure.

9 = Neurotic condition, and no psychotic condition, present.

Blunted Affect

128. Blunted affect (expressionless face and voice, uniform blunting whatever the topic of conversation, indifference to distressing topics, whether delusional or normal).

1 = Blunting not uniform, e.g. at times responds affectively but at other times is markedly flat; or responds with some evidence of affect, but definitely less than expected.

2 = Severe and uniform blunting.
Incongruity of Affect

129. Incongruity of affect (emotion is shown, but not congruent with topic)

RATINGS
0 = Symptom absent.
1 = Present in fairly severe degree, or very severe but intermittent during interview.
2 = Presenting in very severe degree and almost continuous during interview.
8 = Examiner not sure.
9 = Subject not examined, or examination not appropriate.

N.B. If in doubt, rate (0). A rating of (1) means there is no doubt about the symptom being present in fairly severe form.

138. Poverty of content of speech. The subject talks freely but so vaguely that little information is given in spite of the number of words used: rambles on without coming to a point; may wander far from original theme. Exclude incoherence or flight of ideas. Rate only if severe and always give written example.

RATINGS
0 = Symptom absent.
1 = Present in fairly severe degree, or very severe but intermittent during interview.
2 = Presenting in very severe degree and almost continuous during interview.
8 = Examiner not sure.
9 = Subject not examined, or examination not appropriate.

N.B. If in doubt, rate (0). A rating of (1) means there is no doubt about the symptom being present in fairly severe form.
Employment-Heterosexual Adjustment During the Following Period

Prognostic Scale items 1a, 3a, and 4 (Strauss & Carpenter, 1974)

1A Quantity of useful work in past year. (Include as job: paid work, student, housewife. Exclude time in hospital. Any hospitalization in past year would not contribute to lower score. Working as a student for a full academic year would be rated "4").

"Employed" full time continuously.............................. 4
"Employed" for about 3/4 of the year's working hours
(e.g., full time work for 9 months).............................. 3
"Employed" for about 1/2 of the year's working hours
(e.g. employed half time continuously or full time for 6 months).............................. 2
"Employed" for about 1/4 of the year's working hours
(e.g., half time work for 6 months)...................... 1
No useful work......................................................... 0

3A Number of social relations most usual in past year. (Meets with friends or does things with social groups, bowling, meetings, etc. EXCLUDE dates with opposite sex or social activities only with spouse.)

Meets with friends on average of at least once a week........ 4
Meets with friends about once every 2 weeks................... 3
Meets with friends about once a month......................... 2
Include all acquaintances

Does not meet with friends, except "over the back fence"
or at work or school......................................................... 1

Does not meet with friends at all under any conditions........... 0

4. Heterosexual relations most usual in past year

Married without divorce or separation, or dates regularly.... 4

Married with conflicts causing brief separation(s),
or dates sometimes....................................................... 3

Unmarried or separated, dates frequently............................ 2

Unmarried or separated, rarely dates.................................. 1

Unmarried or separated, never dates.................................. 0
APPENDIX F
GLOBAL ASSESSMENT SCALE

Rate the subject's lowest level of functioning in the last week by selecting the lowest range which describes his functioning on a hypothetical continuum of mental health-illness. For example, a subject whose "behavior is considerably influenced by delusions" (range 21-30), should be given a rating in that range even though he has "major impairment in several areas" (range 31-40). Use intermediary levels when appropriate (e.g., 35, 58, 62). Rate actual functioning independent of whether or not subject is receiving and may be helped by medication or some other form of treatment.

100 No symptoms, superior functioning in a wide range of activities, life's problems never seem to get out of hand, is sought out by others because of his warmth and integrity.

90 Transient symptoms may occur, but good functioning in all areas, interested and involved in a wide range of activities, socially effective, generally satisfied with life, "everyday" worries that only occasionally get out of hand.

81 Minimal symptoms may be present but no more than slight impairment in functioning, varying degrees of "everyday" worries and problems that sometimes get out of hand.
Some mild symptoms (e.g., depressive mood and mild insomnia) OR some difficulty in several areas of functioning, but generally functioning pretty well, has some meaningful interpersonal relationships and most untrained people would not consider him "sick".

Moderate symptoms OR generally functioning with some difficulty (e.g., few friends and flat affect, depressed mood and pathological self-doubt, euphoric mood and pressure of speech, moderately severe antisocial behavior).

Any serious symptomatology or impairment in functioning that most clinicians would think obviously requires treatment or attention (e.g., suicidal preoccupation or gesture, severe obsessional rituals, frequent anxiety attacks, serious antisocial behavior, compulsive drinking.)

Major impairment in several areas, such as work, family relations, judgment, thinking or mood (e.g., depressed woman avoids friends, neglects family, unable to do housework), OR some impairment in reality testing or communication (e.g., speech is at times obscure, illogical or irrelevant), OR single serious suicide attempt.
30 Unable to function in almost all areas (e.g., stays in bed all day) OR behavior is considerably influenced by either delusions or hallucinations OR serious impairment in communication (e.g., sometimes incoherent or unresponsive) or judgment (e.g., acts grossly inappropriately).

20 Needs some supervision to prevent hurting self or others, or to maintain minimal personal hygiene (e.g., repeated suicide attempts, frequently violent, manic excitement, smears feces), OR gross impairment in communication (e.g., largely incoherent or mute).

10 Needs constant supervision for several days to prevent hurting self or others, or makes no attempt to maintain minimal personal hygiene (e.g., requires an intensive care unit with special observation by staff).