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NEUROPSYCHOLOGY OF DEFICIT WILLED INTENTION IN SCHIZOPHRENIA

BY

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requirements for the degree of
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ABSTRACT

The purpose of this study was to examine a neuropsychological model of schizophrenia put forth by Frith (1992). This model proposed that discrete symptoms seen in schizophrenia represent three types of breakdowns in willed intention. Neuropsychological fluency measures were used to examine relationships between symptom type and performance output. Hypothesized results were: 1) that negative symptoms, seen in schizophrenia, would negatively correlate with the number of correct responses on fluency measures; 2) perseverative symptoms would positively correlate with perseverative errors on fluency measures; 3) disorganized symptoms would positively correlate with rule violating errors on fluency measures; and 4) positive symptoms would produce no significant correlations with erroneous performance on fluency measures. Primary analyses revealed a significant negative correlation between negative symptoms and correct output on fluency measures. Follow up analyses were conducted to examine the effects of distraction on disorganized symptoms. Follow up analyses also included demographic variables of estimated IQ and Calgary Depression Scale scores. These results as well as research and clinical implications are discussed.

CHAPTER I

INTRODUCTION

Recent neuropathological and neuroimaging studies have served to revive interest in schizophrenia as a neuropsychiatric disease with putatively identifiable neuropathophysiology (Hoff, Riordan, O'Donnell, Stritzke, Neale, Boccio, Anand, & DeLisi, 1992). In the field of schizophrenia research there is currently broad agreement that schizophrenia is a brain disease that reliably results in various impairments in neuropsychological function (Randolph, Goldberg, & Weinberger, 1993). In order to be understood as a brain disease, however, schizophrenia must make neuropsychological sense (Heinrichs, 1993). Schizophrenia must have a set of signs and symptoms that can be observed or elicited and which result in behavioral consequences that are understandable in terms of functional properties of affected brain areas. "The potential contribution of neuropsychology to elucidating hypotheses of localized neuropathology in schizophrenia is considerable" (Levin, Yurgelun-Todd, & Craft, 1989, p.341). Standardized neuropsychological tests are particularly advantageous because they are reliable and have been validated on patient groups with known neuropathological insult yielding useful brain-behavior correlates (Goldberg, Ragland, Torrey, Gold, Bigelow, & Weinberger,1990).

Study Rationale

The purpose of this study was to examine Frith's (1992) neuropsychological model of negative and positive sign schizophrenia and to test hypothesized patterns of

performance on neuropsychological tests of verbal and non-verbal fluency. This study provides several advances over previous research in this area in that, numerous studies have demonstrated neuropsychological deficits in schizophrenia, however, they have not explained the heterogeneity of symptoms seen in the disorder. Studies that have attempted to study subtypes of symptoms to control for the heterogeneity problem, have done so without a theoretical model by which to follow. Strauss (1993) stated that future needs in the neuropsychological understanding of schizophrenia include the study of specific symptoms rather than symptoms constructs. Additionally, research should attempt to explain neuropsychological deficits based on an a priori theoretical framework. This study attempted to address those needs by utilizing Frith's (1992) theoretical framework to provide a neuropsychological explanation for the variety of schizophrenic symptoms seen in individual patients.

It was hypothesized that on select fluency measures, patients in the Negative Sign group (those designated as having poverty of speech and action, as defined by Frith, on independent measures), were hypothesized to a paucity of correct responses compared to the other groups on timed fluency tests. Performance of this nature is thought to reflect a breakdown between goal formulation and willed intention which produces diminished generation of responses as illustrated in the model.

The Stereotype Sign Group included patients (determined as having stereotyped behaviors, as defined by Frith, on independent measures) who were hypothesized to show a preponderance of inappropriate perseverative responses on timed fluency tests. Performance of this nature is characteristic of impairment along the "willed route" to action, such that executed actions are not terminated appropriately, as described in Frith's

paradigm.

Patients in the Incoherent Sign Group (those who demonstrate incoherent speech and incongruent affect, as defined by Frith, on independent measures) would presumably demonstrate responses not meeting criteria for a correct response on timed fluency tests. This type of performance is said to reflect a deficit in willed intention where goals fail to inhibit stimulus-driven responses. The presence of internal or external stimuli tend to act as distracters which contributes to erroneous performance in meeting goals.

Finally, Positive Symptoms Control Group participants (those designated as having delusions and hallucinations on independent measures) were expected to show performance consistent with a normal level of correct output as well as responses which were devoid of perseverations and errors. Performance of this nature was thought to illustrate no deficits in "willed intention". The hypothesized outcomes are seen in Table 1.

Table 1. Hypothesized Outcomes by Group on Neuropsychological Fluency Measures

Group	Total number of correct responses on tests: 1, 2, 3, 4	Number of perseverative responses on tests: 1, 2, 3, 4	Number of incorrect responses on tests: 1, 2, 3, 4
Positive symptom control group	Normal performance	Normal performance	Normal performance
Negative sign group	**Reduced number of correct responses**	Normal performance	Normal performance
Stereotyped sign group	Normal performance	**Increased perseverative responses**	Normal performance
Incoherent sign group	Normal performance	Normal performance	**Increased incorrect responses**

Test 1: Controlled Oral Word Association Test
(simple verbal fluency test)
Test 2: Alternate Uses Test
(complex verbal fluency test)
Test 3: Design Fluency Test
(simple nonverbal fluency test)
Test 4: Ruff Figural Fluency Test
(complex nonverbal fluency test)

CHAPTER II

REVIEW OF LITERATURE

Neuropsychology of Schizophrenia

Evidence of neuroanatomical abnormalities in schizophrenia has accumulated and so too has speculation regarding the brain regions or systems which underlie the disorder and associated cognitive impairments. However, attempts to identify neurocognitive dysfunction in schizophrenia have yielded contradictory or ambiguous results, fueling the debate over a diffuse or focal deficit pattern.

Generalized Deficit. Some authors have argued that cognitive impairment in schizophrenic patients is diffuse suggesting that multiple cerebral regions are affected (Chelune, Heaton, Lehman, & Robinson, 1979; Heaton, Baade, & Johnson, 1978). Recently, generalized neurocognitive impairments have been reported in first-episode schizophreniform patients (Hoff, Riordan, O'Donnell, Morris, & DeLisi, 1992) and in outpatients with chronic schizophrenia (Braff, Heaton, Kuck, Cullum, Moranville, Grant, & Zissok, 1991). Blanchard and Neale (1994) evaluated the neuropsychological functioning of non-medicated schizophrenic patients compared to normal controls to determine if patterns of performance were consistent with models of generalized or localized impairment. Their results revealed that schizophrenic patients displayed impairment across measures of frontal lobe functioning, perceptual, motor, and sensory functioning, and verbal and nonverbal memory suggesting a pattern of generalized dysfunction.

A neuropsychological comparison study of monozygotic twins discordant for schizophrenia was conducted in an attempt to control for genetic and environmental variance and to highlight differences due to phenotypic variables (Goldberg et al., 1990). It was concluded that affected twins performed worse than the unaffected twins and normal twins on most of the neuropsychological tests administered. The overall pattern of cognitive impairment in the sample was suggestive of diffuse cortical dysfunction.

Localized Deficit. The search for the neuropsychological signature of schizophrenia has also led to studies in which findings have been interpreted as evidence of lateralized or localized impairment. Neuropsychological findings have been interpreted to reflect subcortical brain dysfunction (Pantelis, Barnes, & Nelson, 1992; Patterson, 1987), right hemisphere dysfunction (Posner, Early, Reiman, Pardo, & Dhawan, 1988; Robertson & Taylor, 1987), left hemisphere dysfunction (Crow, 1989; Kolb & Whishaw, 1983; Taylor & Abrams, 1984), frontotemporal dysfunction (Goldberg, Weinberger, Berman, Pliskin, & Podd, 1987; Gruzelier, Seymour, Wilson, Jolley, & Hirsch, 1988), and frontal lobe dysfunction (Beatty, Jocic, Monson, & Staton, 1993; Levin, 1984; Robbins, 1990).

Many of the aforementioned theories have been advanced due to findings of neuropsychological impairment in relatively specific cognitive domains. Previous research has demonstrated that patients with schizophrenia show neuropsychological deficits commonly associated with deficits in frontal lobe function such as an inability to suppress reflexive eye movements (Fukushima, Fukushima, Chiba, Tanaka, Yamashita, & Kato, 1988). Katsanis and Iacono (1991) also revealed that chronic schizophrenic patients demonstrated impairment in smooth pursuant eye tracking as well as impairment on neuropsychological measures that assess frontal lobe function. These authors suggest an

association between dysfunctional eye tracking and frontal lobe function.

Goldberg, Weinberger, Berman, Pliskin, and Podd (1987) stated that poor performance on one of the most reliable findings in schizophrenia research is patients poor performance on the Wisconsin Card Sorting Test (WCST). Authors administered the WCST to three groups of patients with schizophrenia. Two of the groups received incremental information on how to do the test while the third group was given the standardized administration. Except while receiving card-by-card instructions, patients performed poorly on the test, regardless of group and returned to their baseline poor performance when the structure was discontinued. Another study demonstrated that schizophrenic patients displayed deficits on the problem solving and memory for visual designs aspects of the WCST (Goldberg, Gold, Greenberg, Griffin, Schilz, Pickar, Kleinman, & Weinberger, 1993). Deficits on the WCST by patients with schizophrenia were associated with frontal lobe dysfunction, specifically due to diminished cerebral blood flow to the dorsolateral prefrontal cortex (Goldberg et al., 1987; Goldberg, Torrey, Gold, Ragland, Bigelow, & Weinberger, 1993).

Perry and Braff (1994) demonstrated support for the hypothesis that information-processing failures are associated with thought disorder and impairments in part of the cortical-striatal-pallidal-thalamic circuit. While chronic schizophrenic patients are commonly found to have lower than normal levels of intelligence, it was discovered that speed of cognitive processing was relatively more impaired than overall intelligence (Nelson, Pantelis, Carruthers, Speller, Baxendale, & Barnes, 1990). This study implicated a subcortical pathology in information-processing inefficiency.

Attentional deficits have received intensive study and have been thought to explain various deficits in higher cortical functioning (Nuechterlein & Dawson, 1984). Evidence has been found for impairments in attention that could not be ascribed to deficits in motivation (Posner et al., 1988). Specifically, patients with schizophrenia were found to have slow processing of right-side visual field targets and visual words when attention was not correctly cued with symbolic directional cues. An abnormality in the ventral striatum and anterior cingulate may result in this kind of attention deficit in schizophrenia (Posner et al., 1988).

Kenny and Meltzer (1991) have also suggested that deficits in attention may not underlie impaired recall of newly learned information or retrieval of information from semantic memory. Rather, these memory and learning deficits may be associated with temporo-hippocampal and basal ganglion dysfunction. Other studies of selective memory and learning impairments seen in schizophrenia have also implicated the temporo-hippocampal system to a greater degree even in the presence of diffuse dysfunction (Saykin, Gur, Gur, Mozley, Mozley, Resnick, Kester, & Stafiniak, 1991; Schwartz, Rosse, & Deutsch, 1992). In their study of monozygotic twins discordant for schizophrenia, Goldberg et al., (1993) found that affected twins performed significantly worse on declarative memory tasks and verbal fluency than the unaffected group producing a neuropsychological profile which is consistent with frontal and medial temporal lobe dysfunction.

In order to be understood as a brain disease, schizophrenia must first be understood as a clinical entity which is distinct from other disorders. Heterogeneity of symptoms has hindered many neuropsychological studies of the disorder (Addington &

Addington, 1993; Blanchard & Neale, 1994; Brown & White, 1991; Gruzelier et al, 1988; Levin et al, 1989; Mauri, Borri, Giannotti, Zambotto, Cassano, & Akinskal, 1992; Perry & Braff, 1994; Saykin et al, 1991; Schroeder, Buchsbaum, Siegel, Geider, Niethammer, 1995). "The need for symptomatic and behavioral coherence and integrity is paramount" (Heinrichs, 1993, p.230). To meet this need, problems with variability and heterogeneity seen in schizophrenia must be addressed.

Neuropsychology of Subtypes

Attempts to partition symptoms into subtypes may establish more homogenous groups and facilitate the testing of more specific neuropsychological functions. The rationale for this approach is that assigning patients to subgroups may alleviate ambiguous results. Thus, subgroups may show specific deficits. Subtyping psychiatric symptoms is an attempt to impose structure on the etiology and prognostic course of severe mental disorders (Sass, 1989). Schizophrenia has almost always been described in terms of bipolarity. Notable dichotomies include: reactive vs process, accessory vs fundamental, active vs residual, and florid vs deficit, all of which contribute to the valence of today's positive-negative distinction (Sass, 1989).

The historical roots of the concept of positive and negative schizophrenia stem from Jackson (1887) who was the first to apply the concept to psychiatry. Jackson assumed a hierarchical-evolutionary model of the mental apparatus, in which negative symptoms were caused by a loss of normal functions and abilities, while positive symptoms were an exaggeration of normal functions. Kraepelin (1971, cited in Carpenter, 1992) went on to describe two principle disorders that characterize dementia praecox.

These disorders include a dissociative process thought to underlie positive symptoms and a weakening of volition thought to underlie negative symptoms. The first explicit hypothesis that positive and negative phenomenologies represent different pathologies within schizophrenia came from Strauss (1974, cited in Crow, 1980) and was soon elaborated by Crow (1980).

Crow postulated two syndromes of psychopathologic processes in schizophrenia. Type I had mainly positive symptoms of hallucinations, delusions, and thought disorder. It was termed acute schizophrenia and characterized by good premorbid functioning, acute onset of episodes, neuroleptic responsiveness, and better long-term outcome without intellectual deterioration. Type II disorder had mainly negative symptoms of affective flattening and poverty of speech and was termed chronic schizophrenia. It was characterized by poor premorbid functioning, insidious onset, neuroleptic resistance, and poorer long-term prognosis with intellectual deterioration. The current positive-negative construct has been investigated as a semi-independent subset of schizophrenic pathologies (Carpenter, 1992).

Deficits in affective and cognitive realms have often differentiated between positive and negative schizophrenia. Positive schizophrenia is characterized by delusions, hallucinations, and formal thought disorder without the presence of negative symptoms. Conversely, negative schizophrenia is defined by a poverty of speech and speech content, psychomotor retardation, restricted affect, and anhedonia with few or no positive symptoms (Carpenter, Heinrichs, & Wagman, 1988).

Recent factor analytic studies have found evidence of a three-symptom trichotomy. Liddle and Barnes (1990) examined chronic schizophrenic patients and concluded that

symptoms segregated into three syndromes: psychomotor poverty, disorganization, and reality distortion. Confirmation or these findings was attained in a follow-up study as well (Liddle & Barnes, 1990; Miller, Arndt, & Andreasen, 1993).

Neuropsychological studies have attempted to explain the specific cognitive deficits underlying the behavioral presentation of positive, negative, and disorganized schizophrenia (Blanchard & Neale, 1994; Goldberg et al, 1990; Gruzelier et al, 1988; Keilp, Sweeney, Jacobsen, Solomon, St. Louis, Deck, Frances, & Mann, 1988; Liddle & Barnes, 1990; Saykin et al, 1991). "Different patients may show different patterns of neuropsychological deficits, and these patterns may help define disease heterogeneity" (Sullivan, Shear, Zipursky, Sagar, & Pfefferbaum, 1994, p.652). Defining disease heterogeneity will establish more homogeneous groups and facilitate testing of more specific neuropsychological functions.

Negative Symptoms. Addington and Addington (1993) found associations between negative symptoms and poor premorbid functioning and between poor premorbid functioning and deficits on neuropsychological measures of verbal reasoning and concept formation. Patients with negative symptoms produced lower verbal IQ scores on the Wechsler Adult Intelligence Scale (WAIS) and produced more perseverative and total errors and completed fewer categories on the Wisconsin Card Sort Test (WCST). These results led authors to conclude that negative symptoms were related to cognitive deficits on measures of frontal lobe functioning. Another study found that only perseverative errors on the WCST were found to differentiate groups of mild and severe negative symptom patients when controlling for the presence of drug-induced akathesia (Brown & White, 1991).

A study by Sullivan et al, (1994) hypothesized that deficits on tasks that assessed prefrontal cortical functioning would correlate with negative symptoms. Authors found that disease duration, thought to correlate with Crow's (1980) type II symptoms, was associated with lower scores on executive functions measures including tasks of declarative and short-term memory.

Schizophrenic patients with negative symptoms of alogia and affective flattening also produced poorer performance on tasks of verbal and design fluency compared to other schizophrenic patients (Stolar, Berenbaum, Banich, & Barch, 1994). A recent study, also involving performance on verbal fluency measures, found that patients with higher negative scores on the Positive and Negative Syndrome Scale experienced more performance difficulty than did patients with higher positive symptoms (Berman, Viegner, Merson, & Allan, 1997).

Positive Symptoms. There is a paucity of research attesting to cognitive impairment in positive symptom schizophrenia as cognitive impairment is thought to be uniquely associated with negative symptoms (Green & Walker, 1985; Arndt, Randall, Alliger, & Andreasen, 1991). However, several studies have been conducted and found support for some neuropsychological deficit in positive symptoms type schizophrenia as well. Green and Walker (1985) conducted a study of which the central finding was that negative and positive symptoms were associated with different deficit patterns of neuropsychological performance. Patients with positive symptom schizophrenia scored below negative symptom patients and normal controls on two measures tapping memory function while negative symptoms were associated with poorer visual-motor and visual-spatial performance. Memory deficits correlating with positive symptoms involved short-

term verbal memory specifically as seen on a sentence repetition test and the Token Test.

A significant relationship was found between positive symptoms (thought disorder and hallucinations), as measured by the Brief Psychiatric Rating Scale (BPRS), and impairment on the Luria Nebraska Neuropsychological Battery (LNNB) memory, intellectual processing, and frontal scales. Scores reflected deficits in abstract reasoning, sequential memory, word fluency, and cognitive flexibility (Dickerson, Ringel, & Boronow, 1991). Additionally, these patients had impaired Wechsler Adult Intelligence Scale-Revised (WAIS-R) scores on Digit Symbol, Arithmetic, and Picture Arrangement subtests implicating impairment in visual processing and attention, and working memory. Thus, while much of the research on positive symptoms failed to demonstrate cognitive impairment, some studies found support for discrete neuropsychological deficits.

Disorganized Symptoms. In addition, negative correlations were found between the number of correct responses on the Wisconsin Card Sort Test (WCST) and the disorganized dimension. This last finding is similar to that of Berman and Weinberger's (1991) study which suggested that higher-order verbal processing and verbal reasoning needed to identify the correct response on the WCST, may be impaired in disorganized symptom schizophrenia. Andreasen (1985) defines symptoms as clinical features of an illness. Their culmination may be used to identify or define a syndrome. "The division of schizophrenic symptoms into positive and negative syndromes is an example of an attempt to describe the heterogeneity of schizophrenia in terms of distinguishable syndromes" (Liddle & Barnes, 1990).

This classification, while appealing, has several deficiencies. The supposition that positive and negative syndromes may have different pathophysiologies is studied by

assessing the symptoms. Having different symptom complexes does not necessarily equate with having different subtypes (Miller, Arndt, & Andreasen, 1993). Many people with schizophrenia have both positive and negative symptoms demonstrating a mixed clinical presentation. The subtyping paradigm does not adequately capture the variety of symptoms seen within the individual. Symptom patterns continue to be ambiguous and evade accurate description.

Preferable to the study of symptom constructs is the study of individual positive and negative symptoms. More preferable still is the development and employment of explicit neuropsychological theories to provide a structural framework to observed symptom patterns (Strauss, 1993). Two conceptual analyses of the neuropsychological substrates of positive and negative symptoms have been advanced by Gray, Feldon, Rawlins, Demsley (1991) and Frith (1992).

Neuropsychological Models

Gray's Deficient Association Learning Model (Gray et al. 1991). This model emphasizes input disturbances or disruptions in the attentional mechanisms that facilitate automatic processing. These authors state that automaticity in information processing fails to develop in Type I schizophrenia. Consequently, people with positive symptoms are less influenced by learning and memory gained from past experience. This model builds on Lubow's (1989, cited in Strauss, 1993) model of latent inhibition. Latent inhibition refers to deficient association learning by pre-exposure to a conditioned stimulus which occurs in normal individuals. Patients with positive symptoms, who are presumably in a hyperdopaminergic state, do not show the pre-exposure effect. Thus, they fail to

monitor and compare current stimuli with past memories, plans, and motor programs.

Gray et al. (1991) propose that the onset of positive symptoms and cognitive abnormalities of Type I schizophrenia lies in the interactions of the corticolimbicstriatal system and the septohippocampal complex. The septohippocampal system is also central to Frith's account of self-monitoring disturbances in positive symptoms schizophrenia.

Frith's Deficient Willed Intention Model (Frith, 1992). In contrast to Gray et al. (1991), Frith's (1992) theory examines willed intention as it relates to discreet symptoms of schizophrenia. Frith (1992) expanded on Shallice's (1988, cited in Frith, 1992) hypothesis of a "Supervisory Attentional System" (SAS). Behavioral abnormalities associated with schizophrenia include a lack of self-initiated activity, perseverative and stereotyped activity, and inappropriate responses to stimuli.

These abnormalities have been explained by Shallice (1988) in terms of defects in the supervisory attentional system. The SAS can modify the strengths of the competing action systems. It might suppress the action currently most activated by environmental stimuli or it can activate a particular action system when none has been selected by the pattern of environmental stimuli. Thus, the SAS can prevent ongoing action, can suppress responses to external stimuli, and can generate novel actions in situations in which no routine action is triggered. These information processing abilities, monitoring of action, inhibition of action, and initiation of action are under control of the frontal lobes (Shallice, 1988). As such, defects in the SAS presume frontal lobe dysfunction.

Studies of patients with frontal lobe lesions, for example, suggest that their behavior is no longer being controlled by a Supervisory Attentional System. They show perseverative behavior, inappropriate stimulus elicited behavior, and a lack of spontaneous

willed behavior (Shallice, 1988).

Many of the symptoms of schizophrenia are observable behavioral abnormalities and, therefore, should more properly be called signs, according to Frith. He defined negative signs of schizophrenia to include poverty of speech, flattening of affect, psychomotor retardation, and social withdrawal. He defined positive signs to include incoherence of speech, incongruity of affect, and stereotypies. Frith's model (1992) proposes neuropsychological explanations for both negative and positive features of schizophrenia based on defects in two routes of action, (see Figure 1).

The "willed route" to action is described as: goals/plans which lead to willed action which produces a response. The "stimulus-driven route" to action is described as: perception leads to stimulus intention which leads to action which produces a response. The model postulates that in negative feature schizophrenia, goals fail to generate intentions. In positive feature schizophrenia, goals either fail to inhibit stimulus-driven actions or fail to terminate on-going actions.

This model postulates that there are three types of abnormalities that can be seen as consequences of the impairment in "willed intention". These include a poverty of action (negative signs), persistent inappropriate responding (stereotyped/perseverative signs), and inappropriate stimulus-driven behavior (incoherent/disorganized signs). Negative signs include poverty of action and speech and are a consequence of defects in the mechanisms underlying the generation of "willed" actions while the mechanisms underlying "stimulus-driven" actions remain largely intact. Deficits in the "willed" route to action may also cause an excess of willed behavior or stereotyped responding. Finally, impairment in the "willed" route of action may make it difficult to inhibit environmental

stimuli and produce what Frith refers to as incoherent behaviors.

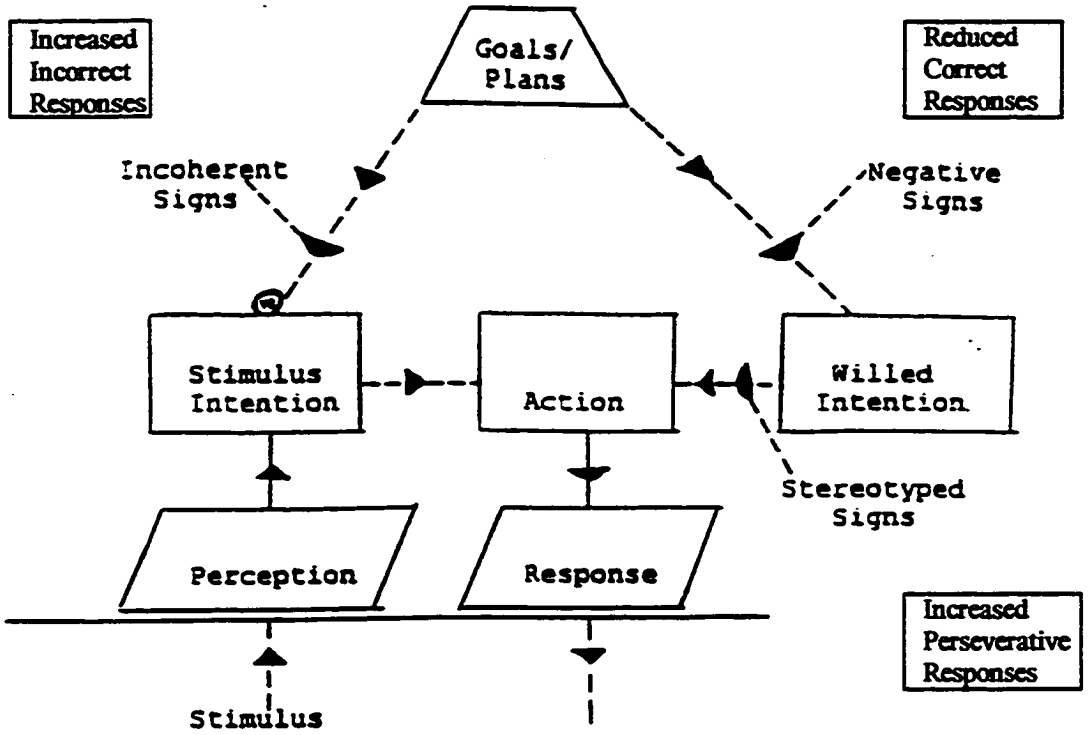

Figure 1. Model of Deficits in Willed Intention (Adapted from Frith, 1992)

Deficits in the "willed" route to action can cause a deficiency resulting in three types of observable behaviors and can be captured on fluency measures. The first of these deficits is poverty of responding. Poverty of responding should result in a paucity of output on timed fluency tasks even though the responses are largely accurate. The second observable behavior is a repetitive inappropriate style of responding which would likely produce stereotyped responses in the forms of repeated words or actions. Finally, responding inappropriately to some signal in the environment, or incoherence, would likely

produce responses indicative of rule violations.

A study conducted by Allen, Liddle, and Frith (1993), utilized verbal fluency tasks with schizophrenic patients, depressed patients, and normal controls. Their results revealed that patients with schizophrenia demonstrated less clustering of words and produced more category-inappropriate words as compared to either the depressed subjects or controls. In addition, schizophrenic patients with negative features produced significantly fewer words and patients that were rated as having incoherence of speech gave more that were not in the requested category

These authors concluded that impaired verbal fluency in chronic schizophrenia patients was not due to a loss of lexical knowledge but rather problems with self-initiated retrieval. Such a deficit pattern has been associated with the left dorsolateral prefrontal cortex (Allen et al., 1993).

In summary, previous studies of schizophrenia have witnessed both generalized and localized deficit patterns on neuropsychological measures. These studies have demonstrated overall conflictual findings which contributes to the ongoing debate regarding genuine deficit patterns within symptom subtypes. Few studies have attempted to adequately address the homogeneity of symptoms seen within schizophrenia. Those studies which have attempted to look at discrete symptoms have, in general, failed to utilize a theory-driven approach using an a prior hypothesis of expected outcomes. This study attempts to meet both needs suggested by Strauss (1993) by utilizing Frith's (1992) theoretical framework to examine specific symptoms seen in schizophrenia to expand the neuropsychological understanding of the disorder.

CHAPTER III

RESEARCH METHODOLOGY

Study Inclusion and Exclusion Criteria

People included in this study were those having any psychiatric diagnosis within the schizophrenia spectrum, as defined by the American Psychiatric Association (1994) in the Diagnostic and Statistical Manual of Mental Disorders (4th ed.)., (DSM-IV), as well as evidence of any of four types of behaviors. These behaviors included: negative signs of schizophrenia as evidenced by behaviors of poverty of speech and action, stereotyped behavior, incoherent behavior, and the presence of positive symptoms as rated by subjective and objective reports on the SANS/SAPS and the SCL-90-R. Exclusion criteria included: 1) the presence of current substance abuse, 2) the presence of head trauma or other diagnosed neurologic disorder aside from their psychiatric disorder, 3) the presence of co-morbid DSM-IV Axis II diagnoses other than schizotypal or paranoid personality disorder, or 4) if the patient was over 65 years of age. Approximately 115 patients with schizophrenia were initially screened for inclusion in the study. Of these, 45 patients were ruled out prior to commencement of testing as they met at least one of the exclusion criteria.

Subjects

To test these hypotheses, 71 patients with schizophrenia were studied. These subjects included 24 outpatients attending the Trinity Mental Health Center day treatment program, 8 patients attending the University of Chicago Center for Psychiatric

Rehabilitation (Tinley Park) day treatment program, 10 outpatient referrals from the University of Chicago Hospitals, 20 outpatient referrals being seen through the Psychiatry Clinics at the University of Iowa Hospitals, and 10 in-patients at the University of Iowa Hospitals. All participants were matched for age, gender, and intellectual level. Information pertaining to their diagnosis and medication status was obtained from medical or clinic records.

Participants were determined according to performance on measures quantifying negative, stereotyped, incoherent, and positive signs of schizophrenia as discussed by Frith (1992). These measures included the Scale for the Assessment of Negative Symptoms (SANS)/Scale for the Assessment of Positive Symptoms (SAPS) (Andreasen, 1983; Andreasen, 1984) and the Symptom Check List-90-R (SCL-90) (Zachary, 1986). Control measures were utilized in an attempt to assess and control for the effects of depression and intellect. Finally, neuropsychological fluency tests served as the predictor measures.

Control Variable Measures

The Calgary Depression Scale (Addington, et al., 1992). The Calgary Depression Scale (CDS) is a reliable scale used for assessing depression across both the acute and residual phases of schizophrenia. It is a nine item structured interview scale, in which each item has a four point measure and is anchored by descriptors. Items measure symptoms of depression including, mood and psychophysiological signs, ideas of guilt, and suicidality. This instrument has been found to have high internal consistency and significant strong correlations with the Beck and Hamilton depression scales, and the Brief Psychiatric Rating Scale depression items (Addington et al., 1992). The CDS was utilized

to control for the presence of depression in all subjects.

Psychometric Properties: Internal reliability of this depression scale was assessed using Cronbach's alpha. The correlation coefficient for inpatients was .78, for outpatients was .71, and for all patients was .79. The Calgary Depression Scale had a .82 correlation with the Hamilton Depression Scale, .79 with the Beck Depression Scale, .87 with the Brief Psychiatric Ratings Scale, and .64 with the presence of a major depressive episode. This instrument was found to have a high coefficient of discrimination (.96 for all patients) and low root mean square residual (.039 for all patients) which indicates strong construct validity (Addington et al., 1992).

Shipley Institute of Living Scale (Zachary, 1986). This test is periodically used as a screening instrument for cognitive dysfunction and includes a timed 10 minute vocabulary test and a timed 10 minute abstract thinking test. This test provides formulae for estimating Wechsler Full Scale IQ scores. It was administered to participants to provide an estimated IQ score.

Psychometric Properties: Split-half reliabilities were computed by dividing the scale into odd and even numbered items on the whole measure, then computing separate reliability coefficients for the Total score and the two subtests based on Mental Age scores. The corrected correlation coefficients using the Spearman-Brown computational formula were .87 for the Vocabulary subtest, .89 for the Abstraction subtest, and .92 for the Total score. Test-retest reliabilities ranged from a median of .60 for Vocabulary to .78 for Total score. Concurrent validity between the Shipley Institute of Living Scale and the Wechsler Adult Intelligence Scale-Revised was found to range from .74 to .85 in studies comparing the scales on estimations of IQ (Zachary, 1986).

Dependent Variables Measures

The Scale for the Assessment of Negative Symptoms/Scale for Assessment of Positive Symptoms (Andreasen, 1983; Andreasen, 1984). The Scale for the Assessment of Negative Symptoms (SANS) was the first comprehensive instrument developed to assess negative symptoms of schizophrenia. It was complimented by The Scale for the Assessment of Positive Symptoms (SAPS) which provides evaluation of global ratings of delusions, hallucinations, bizarre behavior, and positive formal thought disorder (Andreasen, 1989). Factor analytic studies have been conducted on the SANS/SAPS and results indicate a reliable three-dimensional model of symptomatology (Arndt, Randall, Alliger, & Andreasen, 1991). The SANS/SAPS is a structured clinical interview which provides a reliable definition and description of a wide range of symptoms based on objective observational items. The two scales together provide comprehensive assessment of negative, positive, and disorganized symptoms of schizophrenia and measures their change over time.

Psychometric Properties: The global ratings of the five major negative symptom subscales produced reliability coefficients of .69 for alogia, .87 for affective flattening, .76 for avolition apathy, .73 for anhedonia asociality, and .74 for attentional impairment. Internal consistency of negative symptoms based on Cronbach's alpha produced reliability ratings of .62 for alogia, .83 for affective flattening, .74 for avolition apathy, .74 for anhedonia asociality, .75 for attentional impairment, and .85 for global ratings (Andreasen, 1989).

Symptom Check List-90-R (Derogatis, 1983). This 90 item list of medical and

psychiatric symptoms contribute to the score on one of nine primary symptom dimensions including an Obsessive-Compulsive dimension. Scores are computed into three global indices including: the Global Severity Index, the Positive Symptoms Distress Index, and the Positive Symptom total. This test has been proven particularly useful in neuropsychological populations especially for attention and memory problems seen in patients with elevated Obsessive-Compulsive Scores. This was administered to assess for the presence of stereotype behaviors to help differentiate the perseveration group.

Psychometric Properties: Internal consistency ranged from .77 to .90 for the psychoticism subscale. Interrater reliability/construct validity was assessed comparing the SCL-90 Analogue (clinicians ratings) with self-ratings. Reliability coefficients when two clinicians use the Analoque to rate the same target person range from .78 for the psychoticism subscale to .94 for the somatization subscale. Coefficients comparing self-ratings and clinician ratings range from .20 for the interpersonal sensitivity subscale to .50 for the anxiety subscale. Finally, the internal consistency of the Obsessive-Compulsive symptom subscale had a coefficient of .86 and the test-retest reliability for this dimension was .85. (Derogatis et al., 1973). No specific information pertaining to the coefficient for self-rating and clinician rating could be found for the Obsessive-Compulsive scale.

Predictor Variables Measures

Verbal Fluency Measures

Controlled Oral Word Association Test (Benton, Eslinger, & Damasio, 1981; Spreen & Strauss, 1991).

The Controlled Oral Word Association Test (COWAT) provides information about the overall level of speeded ability to generate

words and simple verbal fluency. It has proven to be a sensitive indicator of frontal lobe brain dysfunction. The test consists of three, one minute, word-naming trials for words beginning with a designated letter (F, A, S) and three, one minute, word-naming trials for words belonging to a designated category (Animals, Vegetables, Parts of a House).

The measure of correct responses was the number of different words generated by the patient that meet the stated rule within one minute. The measure of perseverative responses was the number of repeated words generated by the patient that meet the stated rule within one minute. Finally, the measure of incorrect responses was the number of different words generated by the patient that do not meet either the designated letter or the designated category rule within one minute. If the patient gave a response that was a repetition of an erroneous response, then the response was counted as both a perseveration and as an incorrect answer.

Psychometric Properties: Interscorer reliability for the whole measure in older adults has been reported as .70. Retest reliability for the measure in adults after 19-42 days was .88 (Snow et al., 1988, cited in Spreen & Strauss, 1998). Coelho (1984) established construct validity in several studies which generally indicated better validity for the letter fluency than for the more concrete name fluency (cited in Spreen & Strauss, 1991). Correlation of letter fluency with age was -.19 and with education was .32. Correlations with the Wechsler Adult Intelligence Scale Verbal IQ was .14 and with Performance IQ was .29 (Yeudall et al., 1986, cited in Spreen & Strauss, 1998).

Alternate Uses Test (Guilford, Christensen, Merrifield, & Wilson, (1978). This is a complex task which evaluates flexibility in thinking. It assesses convergent and divergent thinking given that frontal lobe subjects are particularly

susceptible to deficits in divergent thinking. Subjects are given verbal and written instructions which ask them to consider six common objects (pencil, car tire, eyeglasses, shoe, key, button) and to verbally generate as many other uses for the object or its parts as they can. They are given four minutes to consider three objects at a time.

The measure of correct responses was the number of different alternate uses that the patient generated, either conventional or non-conventional in nature, within four minutes. Perseverative responses were measured by the number of repetitions of previously stated correct uses, within four minutes. Incorrect responses were measured as those answers that were illogical or inappropriate uses within four minutes. If the participant gave a response that was a repetition of an erroneous response, the response was counted as both incorrect and perseverative.

Psychometric Properties: The Alternate Uses Test has a .62 correlation with a measure of empathy which was interpreted as demonstrating a relationship between empathy and cognitive flexibility in people with brain damage (Grattan & Eslinger, 1989, cited in Lezak, 1995).

Non-verbal Fluency Measures

Design Fluency (Jones-Gotman & Milner, 1977). This test of simple non-verbal fluency, analogous to Thurstone's Word Fluency Test, assesses the ability to generate novel visual designs under a time constraint. It was developed to be sensitive to deficits in the anterior parts of the right cerebral hemisphere. The Design Fluency task incorporates two components. The free condition, lasting five minutes, is one in which subjects were instructed to invent drawings that represent neither actual nor nameable objects. The fixed condition, lasting four minutes, is one in which subjects were

instructed as above but with the additional restriction that they could use only four lines to draw their creations.

The measure of correct responses was the number of different designs the patient generated which were neither actual nor nameable objects, within five minutes in the free condition. In the fixed condition, correct responses were the number of drawn designs that were neither actual nor nameable objects and that utilized four and only four lines produced in four minutes. The measure of perseverative responses was the number of designs that were (a) identical drawings, (b) none of the parts of the designs differed, in angle or dimension, by more than 100%, or the only difference between two designs was a rotation, a mirror representation, or a change in the global dimensions (Daigneault, Braun, & Whitaker, 1992), within the free and fixed time limits. The measure of incorrect responses were those designs that were either recognizable as an actual or nameable object in the free condition. In the fixed condition, incorrect responses were those designs that were recognizable as an actual or nameable object or that utilized fewer or more than four lines. If a design was drawn that was a repetition of an erroneous design, it was counted as both a perseveration and as incorrect.

Psychometric Properties: Reliability correlations for interrater scoring of the whole instrument range from .74 to .87 (Jones-Gotman, 1991 as cited in Lezak, 1995). Ross et al. (1996, cited in Spreen & Strauss, 1998), found interrater reliabilities of .21 to .48 for perseverations and other rule violations. No other psychometric properties were found as this is primarily an experimental instrument which is not frequently used clinically.

Ruff Figural Fluency Test (Ruff, Light, & Evans, 1987). This is test

of complex nonverbal fluency which assesses cognitive flexibility and response speed through a visuospatial mode. This task is believed to evaluate neuropsychological aspects of spontaneity, perseverative tendencies, and self-awareness. Subjects were presented with five pages, the first page has 35 frames containing identical five-dot arrays. They were told to connect two or more of the dots to make a different pattern in each frame. The next two pages have 35 frames and included distracters along with the same five-dot arrays and the final two pages presented 35 frames of different five-dot arrangements with no distracters. Subjects were given one minute to complete as many frames as possible per page (Ruff et al., 1987).

Correct responses were measured as those which utilized at least two dots, which differed from all other patterns, and in which the lines drawn did not leave the individual boxes within one minute. Perseverative responses were those which were duplications of a correct production on the same page within one minute. Finally, incorrect responses were those which utilized distracter stimuli instead of appropriate stimuli to make the productions or in which the lines drawn left the individual boxes within one minute. In the event that a repetition of an erroneous response was produced, the response was counted as both a perseveration and as an incorrect.

Psychometric Properties: Test-retest reliability for numbers of unique designs on each trial of the Ruff Figural Fluency Test produced correlation coefficients of .58 for trial one, .59 for trial two, .67 for trial three, .60 for trial four, .69 for trial five, and .76 for total score. Test-retest of perseveration scores on the whole test produced a .36 correlation coefficient (Ruff et al., 1987). Ross et al. (1996) found an interrater reliability coefficient of .80 to .98 for scoring parameters of this test (cited in Spreen & Strauss,

1998).

Procedure

The evaluation including the symptom and neuropsychological assessments was completed in one day, lasting approximately 2 hours per participant. Participants received measures in this order: The SANS/SAPS, the COWAT, the Alternate Uses Test, the Design Fluency Test, the Ruff Figural Fluency Test, the SCL-90-R, the Calgary Depression Scale, and the Shipley Institute of Living Scale. Rest breaks were offered to participants following administration of the SANS/SAPS and again following the Ruff Figural Fluency Test. Break time did not exceed three minutes when breaks were accepted.

Data Collection and Analysis

To ensure confidentiality, all subjects were assigned ID numbers by the principal investigator. This ID number was recorded on the actual test record forms containing the data. Names were only be presented on a cover sheet which were separated from the test data.

Numerous attempts were made to assign study participants into appropriate groups in order to conduct an Analysis of Variance study as was originally proposed. Difficulties with this approach included the heterogeneity of symptoms within individuals which minimized a predominant symptom type in many of the study subjects. In addition, those people who did demonstrate a preferential symptom type were too few to formulate groups with substantial enough size. In order to study the data more comprehensively and

to better examine the theory as it was put forth by Frith, the decision was made to utilize a Multiple Regression Approach to data analysis. In this manner symptom mean scores and their relation to performance on the neuropsychological measures could be examined across all subjects.

In the multiple regression analyses, the predictor variable of Correct score was comprised of the correct scores on all fluency measures summed together to produce one conglomerate score of correct responses across all six tests. The six tests included the letter and category fluency tests, the alternate uses fluency test, the fixed and free design fluency tests, and the figural fluency test. It was unclear whether a raw score of the total number of correct responses or a percentage of correct responses across all the fluency tests would adequately capture the expected paucity of correct output. A correlation between the two options was conducted to see if they were comparable. The results were significant at the level $p<.01$ with a correlation coefficient of .950. Therefore, the decision was made to use the raw score of correct responses across all measures.

The predictor variable of Perseverative score was comprised of the perseverative errors on all fluency measures summed together to produce a conglomerate score of perseverative errors across all six tests. Finally, the predictor variable of Incorrect score was comprised of the rule violating errors on all fluency measures summed together to produced on conglomerate score of incorrect errors across all six tests.

The criterion variables in the following analyses include the SAP mean score which was formed by taking the mean of the two global scores from the Scale for the Assessment of Negative/Positive Symptoms (SANS/SAPS) which load on the factor of positive symptoms. The positive symptoms factor is comprised of the hallucinations and delusions

subscales. This score is heretofore referred to as the SAP mean score. The dependent variable referred to hereafter as SAN, mean was formed by taking the mean of the five global scores, on the from the SANS/SAPS which load on the factor of negative symptoms. The negative symptoms factor is comprised of the affective flattening, alogia, avolition-apathy, anhedonia-asociality, and attention subscales. The dependent variable called DIS mean was formed by taking the mean of those global scores of the SANS/SAPS which load on the disorganized factor. The disorganized factor is comprised of the bizarre behavior, inappropriate affect, and positive formal thought disorder subscales. Finally, the dependent variable of PER mean was formed by taking the mean of the ten items from the SCL-90-R which load on the obsessive-compulsive scale of that instrument. These include items: 3, 9, 10, 28, 38, 45, 46, 51, 55, and 65. By using multiple regression analysis to explore Frith's theory of Deficit Willed Intention, the potential predictive relationships between neuropsychological measures and schizophrenia symptom type were examined.

CHAPTER IV

RESULTS

The purpose of this study was to examine the relationship between the predictor variables of Correct score, Perseverative score, and Incorrect score and the criterion variables of SAP mean, SAN mean, DIS mean, and PER mean, as well as to examine salient demographic variables and their relationship to the dependent variables. The hypotheses set forth here remain similar to those originally proposed. It was hypothesized a low Correct score would significantly predict negative symptoms, exemplified by the (SAN mean) score, over and above the predictive power of the perseverative and incorrect scores. The second hypothesis was that the Perseverative score would account for a significant amount of variance on the measure of perseverative symptoms (PER mean) over and above the predictive power of the correct and incorrect scores. The third hypothesis was that the Disorganized score would significantly predict scores on the measure of disorganized symptoms (DIS mean) over and above the predictive power of the correct and perseverative scores. The final hypothesis was that positive symptoms (SAP mean) would not be predicted by any of the response measures as it is to serve as the control measure.

A decision rule was made determining exclusion of outliers from the data set. Outliers in this study were those individuals found to have scores four standard deviations from the mean on any of the dependent or predictor variables. Preliminary examination of the data found an outlier on the Perseverative score variable. As such, that case was

removed from the study and all remaining analyses were based on a data set of 71 individuals. Table 2 includes the data set descriptive statistics.

Table 2. Descriptive Statistics for Data Set

	N	Minimum	Maximum	Mean	Standard deviation
Age	71	19.00	62.00	37.17	10.34
Education	71	6.00	19.00	12.75	2.61
Estimated IQ	69	63.00	119.00	89.07	15.58
Age of illness onset	69	12.00	49.00	23.83	7.45
Vocabulary T score	69	17.00	65.00	42.97	11.98
Father's education	55	8.00	22.00	13.02	3.36
Mother's education	63	8.00	22.00	13.13	2.58
Calgary depression rating	71	0.00	15.00	3.65	3.45
Number of medications	71	0.00	6.00	2.20	1.49

Age refers the patients' ages at the time of testing. Education is a continuous variable based on the number of completed years of formal education. Estimated IQ was assessed by the Shipley Institute of Living Scale. Age of illness onset is the patient's reported age at the time that they were either diagnosed with schizophrenia or had their first hospitalization due to a psychotic episode. Vocabulary t score was a measure derived from the Shipley Institute of Living Scale which assesses the patient's vocabulary level. Father's and Mother's education levels were the highest grade of formal education attained by the patient's parents. The Calgary depression rating refers to the subject's

score on that instrument which is designed to assess depression specifically in people with schizophrenia. Finally, Number of medications indicates the total number of prescription medications the patient was taking at the time of testing. Frequency statistics for the data set are seen in Table 3. Table 4 is composed of descriptive statistics for the dependent measures in the study and Table 5 contains the descriptive statistics for the predictor variables.

A correlation matrix showing the relationships of the demographic variables to the dependent variables can be seen in Table 6, followed by a correlation matrix showing the relationships of the demographic variables to the predictor variables in Table 7.

The presence of depression has been found to confound negative symptoms in many previous studies of schizophrenia. As seen in these results, SAP mean, the control symptom variable, was found to be significantly correlated with the score on the Calgary Depression Scale score ($r = .357$, $p<.01$) as was the disorganized symptoms score (DIS mean), and the score for perseverative symptoms (PER mean). However, SAN mean, the negative symptom score, was not found to be significantly correlated with the depression variable or any of the other demographic variables. DIS mean was found to be significantly correlated with age ($r = .288$, $p<.05$), education ($r = -.341$, $p<.01$), estimated IQ ($r = -.243$, $p<.05$), and vocabulary T score ($r = -.249$, $p<.05$).

Table 3. Frequency Statistics for Data Set

	Frequency	Percent
Gender		
Male	45	63.4
Female	26	36.6
Ethnicity		
Caucasian	53	74.6
African American	17	23.9
Asian	1	1.4
Handedness		
Right	60	84.5
Left	10	14.1
Ambidexterous	1	1.4
Antidepressant		
Yes	15	21.1
No	56	78.9
Antipsychotics		
Yes	58	81.7
No	13	18.3
Antianxiety		
Yes	21	29.6
No	50	70.4
Mood stabilizer		
Yes	15	21.1
No	56	78.9
Anticholinergic		
Yes	16	22.5
No	55	77.5
Other medications		
Yes	12	16.9
No	59	83.1
Test site		
Day treatment center	32	45.0
Out-patient	31	44.0
In-patient	8	11.0

Table 4. Descriptive Statistics for Dependent Variable Measures: SAP Mean, SAN Mean, PER Mean, and DIS Mean

	N	Minimum	Maximum	Mean	Standard deviation
Scale for positive symptoms mean score (SAP mean)	71	0.00	4.50	1.85	1.25
Scale for negative symptoms mean score (SAN mean)	71	.40	3.40	1.83	0.69
SCL-90-R stereotyped mean score (PER mean)	69	0.00	3.90	1.22	0.94
Scale for disorganized symptoms mean score (DIS mean)	71	0.00	4.00	1.11	0.94

Table 5. Descriptive Statistics for Predictor Variables: Correct Score, Perseverative Score, and Incorrect Score

	N	Minimum	Maximum	Mean	Standard deviation
Total correct responses	71	65.00	369.00	164.23	63.15
Total perseverative responses	71	0.00	64.00	15.11	13.51
Total incorrect responses	71	0.00	55.00	15.40	11.90

Table 6. Correlation Matrix of Dependent and Demographic Variables

	Age	Educat	Est. IQ	Vocab t score	Calgary score	Medic. #	Age of onset	SAP mean	SAN mean	DIS mean	PER mean
Age	1.000	-.161	-.302*	-.240*	.075	.260*	.311**	-.097	-.098	.288*	-.082
Educat		1.000	.646**	.546**	-.186	-.068	.326**	-.060	.036	-.341**	-.156
Est. IQ			1.000	.864**	.123	-.127	.164	.130	-.081	-.243*	.105
Vocab. t score				1.000	.112	-.104	.085	.097	-.177	-.249*	.084
Calgary score					1.000	.139	-.038	.357**	.175	.304*	.601**
Medic. #						1.000	-.148	.027	-.133	.022	.072
Age of onset							1.000	-.014	.048	-.091	-.005
SAP mean								1.000	.083	.328**	.284*
SAN mean									1.000	.191	.272*
DIS mean										1.000	.214
PER mean											1.000

Pearson Correlation: ** Correlation is significant at the 0.01 level (2 tailed) * Correlation is significant at the 0.05 level (2 tailed)

Table 7. Correlation Matrix of Predictor and Demographic Variables

	Age	Educat	Est. IQ	Vocab t score	Calgary score	Medic. #	Age of onset	Correct score	Persev. score	Incorr. score
Age	1.000	-.161	-.302*	-.240*	.075	.260*	.311**	-.492**	-.080	.219
Educat		1.000	.646**	.546**	-.186	-.068	.326**	.429**	-.021	-.286*
Est. IQ			1.000	.864**	.123	-.127	.164	.559**	-.270*	-.410**
Vocab. t score				1.000	.112	-.104	.085	.450**	-.221	-.350**
Calgary score					1.000	.139	-.038	-.091	-.155	-.056
Medic. #						1.000	-.148	-.246*	-.042	.196
Age of onset							1.000	.096	-.022	-.267*
Correct score								1.000	.321**	-.137
Persev. score									1.000	.475**
Incorr. score										1.000

Pearson Correlation: ** Correlation is significant at the 0.01 level (2 tailed)
* Correlation is significant at the 0.05 level (2 tailed)

A correlation matrix of the predictor and dependent variables demonstrates that the Correct score predictor variable correlates significantly with Perseverative score (r = .321**) and the Perseverative score variable is significantly correlated with Incorrect score (r = .475**). See table 8 for these results.

Tables 9, 10, and 11 illustrate correlations between the individual fluency tests within the correct responses, perseverative errors, and incorrect responses in the six fluency measures.

Table 8. Correlation Matrix of Predictor and Dependent Variables

	Correct score	Persev. score	Incorrect score	SAP mean	SAN mean	DIS mean	PER mean
Correct score	1.000	.321**	-.137	.158	-.297*	-.293*	.026
Persev. score		1.000	.475**	.202	-.246*	.059	-.055
Incorrect score			1.000	-.049	-.155	.209	.035
SAP mean				1.000	.083	.328**	.284*
SAN mean					1.000	.191	.272*
DIS mean						1.000	.214
PER mean							1.000

Pearson Correlation:
** Correlation is significant at the 0.01 level (2 tailed)
* Correlation is significant at the 0.05 level (2 tailed)

Table 9. Correlations of Correct Scores Across Individual Tests

	Verbal fluency	Categorical fluency	Alternate uses test	Design fluency-free	Design fluency-fixed	Ruff figural fluency
Verbal fluency	1.000	.703**	.620**	.542**	.627**	.574**
Categorical fluency		1.000	.726**	.513**	.577**	.682**
Alternate uses test			1.000	.555**	.684**	.694**
Design fluency-free				1.000	.788**	.671**
Design fluency-fixed					1.000	.798**
Ruff figural fluency						1.000

Spearman Correlation:
** Correlation is significant at the 0.01 level (2-tailed)

Table 10. Correlations of Perseverative Scores Across Individual Tests

	Verbal fluency	Categorical fluency	Alternate uses test	Design fluency-free	Design fluency-fixed	Ruff figural fluency
Verbal fluency	1.000	.085	.218	.128	-.050	.050
Categorical fluency		1.000	.156	.045	.112	.027
Alternate uses test			1.000	.508**	.297*	.404**
Design fluency-free				1.000	.304*	.328**
Design fluency-fixed					1.000	.160
Ruff figural fluency						1.000

Spearman Correlation:

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

Table 11. Correlations of Incorrect Scores Across Individual Tests

	Verbal fluency	Categorical fluency	Alternate uses test	Design fluency-free	Design fluency-fixed	Ruff figural fluency
Verbal fluency	1.000	.292*	.455**	.335**	.301*	.168
Categorical fluency		1.000	.562**	.044	.141	.099
Alternate uses test			1.000	.149	.253*	.034
Design fluency-free				1.000	.209	.192
Design fluency-fixed					1.000	.392**
Ruff figural fluency						1.000

Spearman Correlation:
** Correlation is significant at the .01 level (2-tailed)
* Correlation is significant at the .05 level (2-tailed)

Multiple linear regression analyses were conducted to examine the amount of variance accounted for in the dependent variables by the predictor variables. The symptom variables were found to have relatively normal distributions which made them the more appropriate choice to be the dependent variables. The method of entry for the predictor variables was one of forced entry by which the hypothesized variable of interest was entered into the regression equation first followed by a block of the remaining predictor variables. The analysis for the positive symptoms, however, utilized a stepwise procedure as it was hypothesized not to correlate with any of the predictor measures.

Analysis 1: SAN Mean

The first of these multiple regression analyses utilized the correct scores variable entered first, followed by a block consisting of both perseverative and incorrect scores, to predict variance in SAN mean. The first equation in the analysis served as a descriptive measure of how well the regression models fit the data. The result of this first regression indicated that the model of correct scores with SAN mean had a significant F (1,69) = 6.676, $p<.05$. The R^2 value is the measure of the proportion of variance in the dependent variable that is explained by the individual or combination of independent variables in a multiple regression analysis. In this analysis, $R^2 = .088$ which was statistically significant. In the second regression analysis, R^2 change was only .043, with F change = 1.638, and p = .202. This indicates that the addition of the second block of variables to the first variable did not contribute to the prediction. Table 12 depicts these regressions.

Table 12. Multiple Regression Analysis for Correct Score, Perseveration Score, Incorrect Score and SAN Mean

Model	Predictor variable	Stand-ardized Beta	df1	df2	F	Sig.	R square	R square change
1	Correct score	-.297	1	69	6.676	.012	.088	
2	Correct score	-.295	2	67	1.638	.202	.131	.043
Block of scores together	Perseverative score	-.075						
	Incorrect score	-.159						

Closer analysis of the individual coefficients in the regression analysis, revealed that the block with all three independent variables in the equation together, a significant predictive relationship was found between SAN mean and correct score at the $p<.05$ level.

The corresponding Standardized Beta scores for the predictors variables were; correct score = -.295, perseverative score = -.075, and incorrect score = -.159. This endorses a significant negative relationship with SAN mean as hypothesized. Neither perseveration score nor incorrect score was found to be significant with SAN mean when examined individually. See Figure 2 for the frequency distribution of the SAN mean scores used in the first analysis.

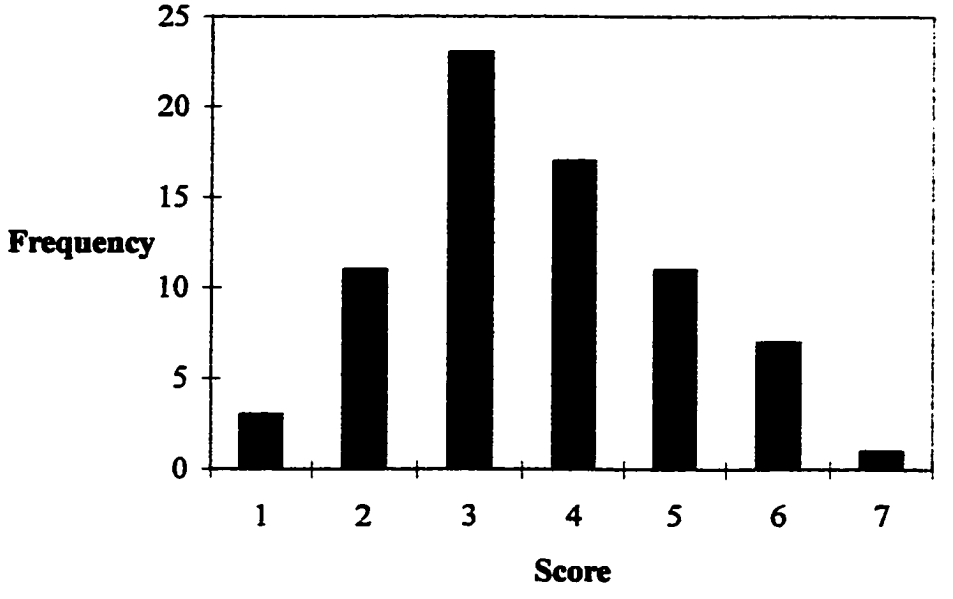

Figure 2. Distribution of SAN Mean Scores

Analysis 2: PER Mean

A second multiple regression was conducted examining the relationship between the predictor variables and the PER mean. The forced entry method of variable entry was employed. In accordance with the hypothesis that there would be a positive relationship

between severity of perseverative symptoms and an increase in perseverative responses on fluency measures, the perseverative score predictor was entered into the equation first. In this analysis, R^2 =..003 which was not significant. It was followed by a block entry adding correct score and incorrect score together. In this second regression analysis, R^2 change = .010, F change = .346, and p = .709, which was not significant. Table 13 illustrates the results of the analysis and Figure 3 displays the distribution of PER mean scores.

Table 13. Multiple Regression Analysis for Perseverative Score, Correct Score, and Incorrect Score and PER Mean

Model	Predictor variable	Stand-ardized beta	df1	df2	F	Sig.	R square	R square change
1	Persev-erative score	-.055	1	67	.200	.656	.003	
2	Persev-erative	-.135	2	65	.346	.709	.013	.010
Block of scores together	Correct	.085						
	Incorrect	.111						

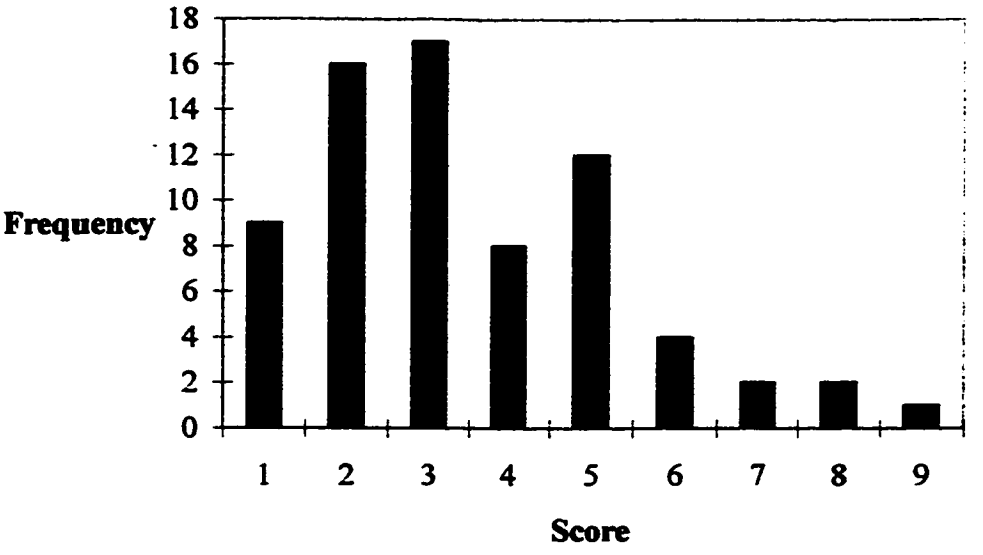

Figure 3. Distribution of PER Mean Scores

Analysis 3. DIS Mean

A third multiple regression analysis examining the relationship between the predictor variables and the DIS mean was conducted. In addition to correct score, perseverative score, and incorrect score as predictors, the vocabulary t score variable was added to this regression as that demographic variable significantly correlated with DIS mean. Again, a forced entry method of variable inclusion was utilized. Incorrect score was entered into the equation first as it was hypothesized to account for more variance within DIS mean than the remaining predictor variables. The $R^2 = .042$ which was not significant. It was followed by the addition of a block of correct score, perseverative score, and vocabulary t score entered together. The results of this analysis were not significant, with R^2 change = .076, F change = 1.829, and p = .151. See Table 14. Figure 4 illustrates the distribution of scores for DIS mean.

Table 14. Multiple Regression Analysis for Incorrect Score, Correct Score, and Perseverative Score and DIS Mean

Model	Predictor variable	Stand-ardized beta	df1	df2	F	Sig.	R square	R square change
1	Incorrect score	.206	1	67	2.964	.090	.042	
2	Incorrect	.112	3	64	1.829	.151	.118	.076
Block of scores together	Correct	-.254						
	Perseverative	.073						
	V.T.	-.079						

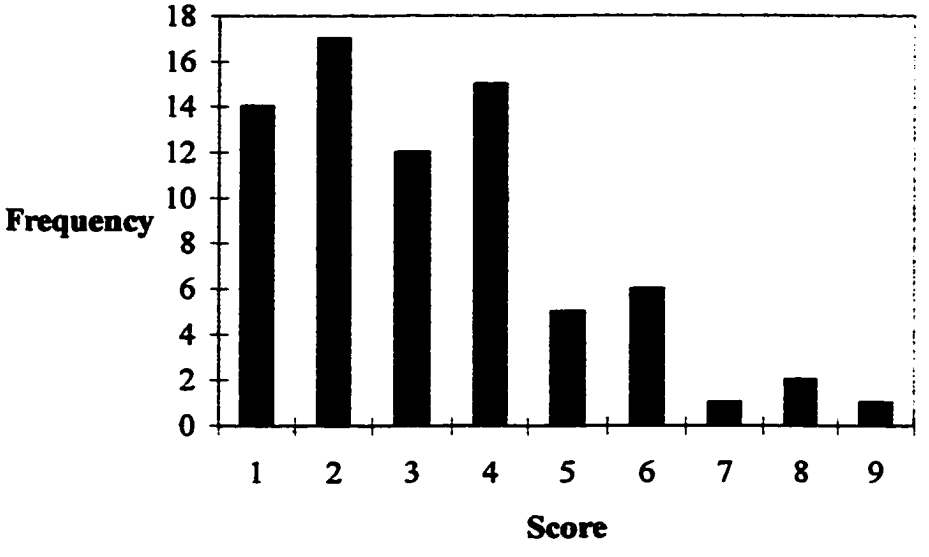

Figure 4. Distribution of DIS Mean Scores

Analysis 4. SAP Mean

To examine the relationship between the control variable, SAP mean, and the predictor variables, a fourth linear multiple regression analysis was conducted. It was hypothesized that there would be no relationship between the predictor variables and the SAP mean control variable. As such, a stepwise method of variable entry was employed with F to enter = .05 and F to remove = .10. The predictor variables entered into the equation, again, included correct score, perseverative score, and incorrect score. Figure 5 displays the distribution of scores for SAP mean.

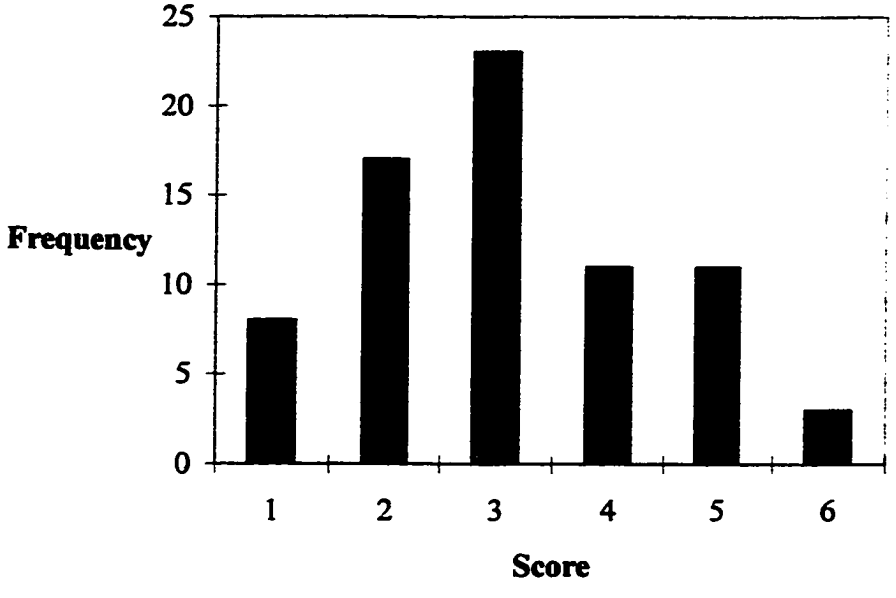

Figure 5. Distribution of SAP Mean Scores

This regression revealed that the perseveration score, correct score, and incorrect score were all nonsignificant. It should be noted that when doing a stepwise method of variable entry, if there are no significant results, the statistics program (Statistics Program

for the Social Sciences, version 8.0) will not generate a table of findings. Only a statement attesting to the fact that the results were all nonsignificant is displayed. Therefore, no data can be illustrated to demonstrate this particular analysis.

This analysis revealed that even as positive symptoms of schizophrenia increased, the number of errors on fluency measures did not. Nor did an increase in positive symptoms correlate with a paucity of correct output . This was in keeping with the original supposition that positive symptoms seen in schizophrenia are not associated with cognitive dysfunction.

Follow Up Analyses

To analyze further the nonsignificant finding between the predictor variables and the DIS mean and to explore the hypothesis of the effects of external distraction on disorganized symptoms, a follow-up simple regression analysis was performed. In accordance with Frith's (1992) model, it was predicted that performance on neuropsychological fluency measures would illustrate more errors in the presence of increased disorganized symptoms. Frith's model states that, within disorganized symptoms, the individual must ignore external or environmental distracting stimuli in order to perform correctly and it is their inability to do that which produces erroneous performance on measures. This study combined error performance on the individual fluency measures to produce one score, the incorrect mean score. It was felt that some of the measures within the incorrect mean score might not have provided the appropriate atmosphere by which to illicit potential errors as not all of the tests had competing external

stimuli. Thus, there may have been a floor effect for the error score in some of the tests. One test, the Ruff Figural Fluency test, did provide the opportunity to look at performance in the presence of external distraction stimuli. The follow-up analysis examined this test closer.

Trial one on the Ruff Figural Fluency test illustrates boxes containing five dots each. Subjects are asked to connect at least two dots to create a different design within each box. Trials two and three of the Ruff Figural Fluency test both utilize different types of visual distracters in the presence of the dots that are supposed to be connected. The test on these trials is the same, connect at least two dots to create a different design in each box. On these trials, however, subjects must ignore the visual distracters to do the task appropriately. A "distracter score" was derived by taking the mean of performance across trials two and three and subtract that mean from the score on trial one.

It was hypothesized that the distracter score would predict a significant amount of variance within the DIS mean but not within the SAN mean, SAP mean, or PER mean. Simple linear regressions were performed in which the distracter score served as the predictor and DIS mean, SAN mean, SAP mean, and PER mean each served as their own dependent variables. The analyses revealed that the prediction between the distracter score and DIS mean produced a significant result, $F(1,69) = 6.826$, $p<.05$. The correlation had a Standardized Beta of .300 and an $R^2 = .090$. Table 15 illustrates the results.

Table 15. Follow Up Simple Regression Analysis for Distracter Score and DIS Mean

Predictor variable	Stand-ardized beta	df1	df2	F	Sig.	R square
Distracter score	.300	1	69	6.826	.011	.090

Simple regressions of distracter score on SAN mean, SAP mean, and PER mean were not significant. This analysis supports the follow up hypothesis that the distraction component of the Ruff Figural Fluency test significantly predicts increases in disorganized symptoms while it does not correlate with increases in negative, positive, or stereotyped symptoms. This finding may support the supposition that the combined Incorrect Score variable masked the potential to accurately test the influence of external stimuli and its impact on disorganized symptoms in the first order multiple regression performed.

A second supposition regarding the effects of distracters on disorganized symptoms hypothesized that internal distraction would be likely to impede performance just as external distraction would. The multiple regression described above utilizing the conglomerate score of errors across tests should have assessed the effects of internal distraction on fluency test performance. However, in light of the issues involved in combining the tests discussed previously, an additional analysis was designed. This design was thought to appropriately access whether internal distraction was associated with disorganized symptoms.

To test this hypothesis, scores on the Design Fluency, free and fixed conditions were explored. The free condition of the Design Fluency task asked participants to draw as many different designs as they could that did not look like anything nameable. They

were given five minutes to do this. The fixed condition of the Design Fluency test asked them to create as many designs as they could that did not look like anything but they had to use four and only four lines to draw them. They were given only four minutes to do this task. The addition of the new rule and the reduction in time to complete the task makes this condition more difficult.

It was hypothesized that the inclusion of additional rules in the fixed condition would heighten internal distraction thought to be present in disorganized symptoms. As a result, performance in the fixed condition would be reduced compared to the free condition. This finding would endorse the supposition that internal distraction in disorganized symptoms is present and becomes taxed when more stringent performance criteria are applied. A "design distraction" score on this test was attained by subtracting the score of the fixed condition from the free condition score. This design distracter score then served as the predictor variable.

Simple regressions were performed for each of the symptom mean scores. It was predicted that the design distracter score would significantly predict disorganized symptoms but no others. The results of these analyses were all non-significant including the analysis revealing that the prediction between the design distracter score and DIS mean, had an $F(1,69) = .329$, $p=.568$. The correlation had a Standardized Beta of .069 and an $R^2 = .005$. Table 16 illustrates the results.

Table 16. Follow Up Simple Regression Analysis for Design Distracter Score and DIS Mean

Predictor variable	Stand-ardized beta	df1	df2	F	Sig.	R square
Design distracter score	.069	1	69	.329	.568	.005

In an effort to examine the relationship between salient demographic variables and the dependent variables, follow-up multiple regression equations were performed. These equations added estimated IQ, and Calgary Depression Scale raw score variables to the existing predictor variables of Correct score, Perseverative score, and Incorrect score. The combined group of demographic and fluency measure scores were examined for their predictive relationship with the dependent variables of SAN mean, PER mean, DIS mean, and SAP mean. Estimated IQ and Calgary Depression Scale raw scores were chosen as they were found to significantly correlate with the dependent variables. Age and education of participants were accounted for in the Estimated IQ so it was not necessary to add these demographic variables into the follow up analyses.

The first follow up analysis utilized a forced entry method of variable inclusion. The Calgary raw score and Estimated IQ variables were entered as a block first, followed by a block adding Correct score, Perseverative score and Incorrect score variables. The results of the first block analysis were not significant with an $R^2 = .039$, $F(2,66) = 1.340$, and $p = .269$. The second model had an R^2 change = .088, F change (3,63) = 2.120, and $p = .107$, which was not significant. See table 17.

Table 17. Follow Up Multiple Regression for Calgary Raw Score, Estimated IQ, Correct Score, Perseverative Score, and Incorrect Score and SAN mean.

Model	Predictor variable	Stand-ardized beta	df1	df2	F	Sig.	R square	R square change
1 Demographic variables	Calgary raw Estimated IQ	.182 -.103	2	66	1.340	.269	.039	
2 Demographic variables and Fluency variables	Calgary raw Estimated IQ Correct Perseverative Incorrect	.136 -.048 -.229 -.081 -.139	3	63	2.120	.107	.127	.088

A second multiple regression analysis examining the relationship between the predictor variables, including Calgary raw score and Estimated IQ, and PER mean was conducted. The forced entry method of variable inclusion was again utilized with Calgary raw score and Estimated IQ variables entered as a block into the equation first followed by a block of Perseverative score, Correct score, and Incorrect score. The result of the first block regression indicated that the model of Calgary raw score and Estimated IQ had a significant $R^2 = .374$, $F(2,64) = 19.134$, with $p.<.01$. The second block regression, illustrated that the addition of Perseverative score, Incorrect score, and Correct scores was not statistically significant, with R^2 change = .029, F change (3,61) = .981, and p = .408. This indicates that the addition of the second block of variables to the first block did not contribute to the prediction. Table 18 depicts these regressions.

Table 18. Follow Up Multiple Regression Analysis for Calgary Raw Score, Estimated IQ, Perseverative Score, Correct Score, and Incorrect Score and PER Mean.

Model	Predictor variable	Stand-ardized beta	df1	df2	F	Sig.	R square	R square change
1 Demographic variables	Calgary raw Estimated IQ	.606 .041	2	64	19.134	.000	.374	
2 Demographic variables and Fluency variables	Calgary raw Estimated IQ Perseverative Incorrect Correct	.627 -.086 -.124 .104 .239	3	61	.981	.408	.403	.029

A third multiple regression analysis utilized the same demographic variables, Calgary raw score and Estimated IQ, along with the fluency measure variables, Incorrect score, Perseverative score, and Correct score, to predict variance in DIS mean. The first regression indicated that the model of demographic variables with DIS mean had a significant $R^2 = .170$, $F(2,66) = 6.770$, $p<.01$. The second block regression, revealed that the model of fluency measure scores added to the demographic variables was not statistically significant, with F change $(3,63) = .997$, and $p = .400$. The incremental change in R^2 was .038 indicating that the addition of the fluency variables did not contribute to the prediction. See table 19 for these results.

Table 19. Follow Up Multiple Regression Analysis for Calgary Raw Score, Estimated IQ, Incorrect Score, Perseverative Score, and Correct Score and DIS Mean.

Model	Predictor variable	Stand-ardized beta	df1	df2	F	Sig.	R square	R square change
1 Demographic variables	Calgary raw Estimated IQ	.336 -.284	2	66	6.770	.002	.170	
2 Demographic variables and Fluency variables	Calgary raw Estimated IQ Incorrect Perseverative Correct	.314 -.072 .111 .114 -.237	3	63	.997	.400	.208	.038

A final follow up multiple regression analysis was conducted examining the relationship between the demographic and fluency measures scores as predictor variables and the control variable, SAP mean. The forced entry method was again used and combined Calgary raw score and Estimated IQ in the first block, and Correct score, Incorrect score, and Perseverative score in the second block. The results revealed a significant first regression model $R^2 = .134$, $F(2,66) = 5.086$, $p.<.01$. The second regression illustrated that addition of Correct score, Incorrect score, and Perseverative scores together with the demographic variables was also statistically significant, with F change $(3,63) = 2.944$, $p<.05$. The incremental change in R^2, was .107. This indicates that the addition of the second block of variables to the first block added 11% of the accounted for variance. See table 20 for detailed results.

Table 20. Follow Up Multiple Regression Analysis for Calgary Raw Score, Estimated IQ, Correct Score, Incorrect Score, and Perseverative Score and SAP Mean.

Model	Predictor variable	Stand-ardized beta	df1	df2	F	Sig.	R square	R square change
1 Demographic variables	Calgary raw	.344	2	66	5.086	.009	.134	
	Estimated IQ	.088						
2 Demographic variables and Fluency variables	Calgary raw	.393	3	63	2.944	.040	.240	.107
	Estimated IQ	.076						
	Correct	.055						
	Incorrect	-.162						
	Perseverative	.340						

CHAPTER V

DISCUSSION

Primary Analyses

The purpose of this study was to examine Frith's (1992) model of negative, disorganized, and perseverative symptoms seen in schizophrenia and to test hypothesized patterns of performance on fluency measures in the presence of those symptoms. Frith's theory is one of metacognitive processes which involve predominantly executive functions such as monitoring and planning of action. This theory endorses a model of localized as opposed to generalized deficits in schizophrenia and attempts to link specific symptoms to breakdowns in underlying central processes. It also identifies dysfunction primarily in the septohippocampal system which serves to monitor stimuli, memory, planning, and motor programs for action completion.

To reiterate, according to the model, negative symptoms seen in schizophrenia exemplify a breakdown in the route of "willed" actions whereby goals fail to generate intentions. It was hypothesized that, in the presence of negative symptoms, this breakdown would also be manifested as a paucity of correct responses on fluency measures illustrated by reduced output. In contrast, disorganized symptoms in schizophrenia exemplify a breakdown in "willed" actions in that goals fail to inhibit stimulus-driven action. This breakdown would then be reflected on fluency measures by inappropriate responding that violates the stated rules. Finally, perseverative symptoms in schizophrenia exemplify a breakdown in "willed" actions where goals fail to terminate ongoing actions. In the presence of perseverative symptoms, performance on fluency

measures should include the expression of inappropriate responding that is repetitive in nature.

To test these hypotheses, multiple regression analyses were used with responses on fluency measures as the predictors of symptom type. This approach was utilized as it allowed for the examination of both the theory put forth and the utility of using neuropsychological instruments to aid in discrete symptom identification within schizophrenic patients.

Hypothesized outcomes were that reduced correct responses on fluency measures would predict negative symptoms, increased perseverative responses would predict perseverative symptoms, and increased errors would predict disorganized symptoms. In addition, it was hypothesized that there would be no significant predictive relationship between the response types and positive symptoms, as these symptoms served as a control. Final results are illustrated in Table 21.

Table 21. Significant Findings in Multiple Regression Analyses

Symptom type	Correct score	Perseverative score	Incorrect score
Negative symptoms	*		
Disorganized symptoms			
Perseverative symptoms			
Positive symptoms			

* Indicates significant findings

In reviewing the first analysis, it was found that a decrease in correct scores significantly predicted negative symptoms. This finding is consistent with the model

proposed by Frith which supposed a relationship between negative symptoms and a paucity of correct responses on fluency measures. Not only did the correct responses adequately predict negative symptoms, they did not significantly predict disorganized or perseverative symptoms. This finding also supported hypothesized outcomes. These results lend credence to the supposition that negative symptoms exemplify a breakdown in the route of willed actions whereby goals fail to generate intentions. This finding is also supported in the neuropsychological research which examines symptom subtypes of schizophrenia. Stolar et al. (1994) found that schizophrenic patients with negative symptoms evidenced poorer performance on tasks of verbal and design fluency compared to other patients with schizophrenia. Impaired verbal fluency was also seen in patients with chronic negative and positive schizophrenia and was thought to be due to problems with self-initiated retrieval of words (Allen et al., 1993). Finally, a recent study found that patients with higher negative scores on the Positive and Negative Syndrome Scale experienced more performance difficulty with verbal fluency measures than did patients with higher positive symptoms (Berman et al., 1997).

The results of the second multiple regression analysis revealed that incorrect responses did not account for a significant amount of variance seen in disorganized symptoms as was hypothesized. One possible explanation for this might be that the fluency measures may not have been able to illicit potential errors in the participants' responses. Ideally, fluency tests should have contained visual or auditory stimuli which would act as a distraction from the task at hand (e.g., a task which asked the participants to draw designs on a page with designs already on it, or a task which asked the participants to verbally generate words in one category while listening to an audiotape of

words in another category). Tests of this nature would serve to determine if the participants could inhibit the competing stimuli to complete the task without errors.

As many of the tasks given in this battery did not have competing stimuli within them, the opportunity for participants to make errors may have been reduced creating a potential floor effect. Examination of the data, however, indicated that a number of individuals made errors suggesting that the potential for error-making was present. Therefore, a follow-up analysis was conducted in an effort to determine the relative contribution of internal vs. external distraction to predict disorganized symptoms. Discussion of these results can be found in the Follow Up Analyses section of this chapter.

This study did not support the third hypothesis, in that, an increase in perseverative errors did not predict discrete perseverative symptoms seen in schizophrenia. The fluency measures gave ample opportunity to make errors of perseveration so they appear to have been appropriate in assessing hypothesized performance. One possibility is that the finding in this regression analysis may be due to the suspected inadequacy of the dependent measures' ability to assess perseverative symptoms. The use of the Obsessive-Compulsive scale of the SCL-90-R was thought to tap stereotypies of thought and behavior similar to that seen in patients with schizophrenia who have a predominance of perseverative symptoms. However, the use of the symptom measure, the SCL-90-R, may have been inappropriate in this patient population by virtue to its self-report format. A better measure to investigate perseverative symptoms would be behavioral measures which observe overt behavioral expression of this type of symptom. It is difficult to derive implications with regard to Frith's model given these results. The syndrome of perseverative symptoms has been difficult to measure as formal measures assessing such

symptoms have historically been neuropsychological measures. No other symptom measure, designed to more adequately capture perseverative symptoms, could be found for use in this study.

The final multiple regression examined the relationship between all of the predictor variables and positive symptoms. It was hypothesized that, as positive symptoms are purported not to correlate with cognitive dysfunction, there would be no significant correlations with the responses of fluency measures. No significant results were found. The implications are that the use of positive symptoms as a control symptom variable appears appropriate as it did not correlate with cognitive dysfunction in this study.

Strauss (1993) observed two issues which need to be addressed in future neuropsychological examinations of schizophrenia. These included, first, the exploration of specific symptoms rather than symptom constructs. A neuropsychological study identified that positive symptoms, for instance, are not a single construct (Gray et al., 1991). Addressing this issue may also help to make sense of the hetereogeniety of symptoms seen in the disorder. Heterogeneity of symptoms has hindered many neuropsychological studies of schizophrenia (Blanchard & Neale, 1994; Perry & Braff, 1994; Schroeder, Buchsbaum, Siegel, Geider, Niethammer, 1995). The contribution of neuropsychological measures to help identify those discrete symptoms appears considerable (Levin et al., 1989).

The second issue to be addressed, according to Strauss, is the development of testable explicit neuropsychological theories of schizophrenia. The information gained from testing these theories will aid in the understanding of the underlying cognitive processes involved in the expression of these discrete symptoms.

The purpose of this study was to attempt to answer the challenges put forth by Strauss (1993) and to address those issues in the neuropsychological understanding of schizophrenia. Frith's model provided a testable guide by which to understand the underlying metacognitive processes suspected in schizophrenic symptoms. By testing this model, this study utilized an a priori hypothesis to examine discrete symptoms as opposed to problematic symptom constructs. The use of multiple regression analyses in this study also allowed for the examination of multiple symptoms which may be seen simultaneously in a single individual. Frith's model assumes that discrete symptoms do not always show a preponderance of one symptom over another but often exist together. As such, this research design more adequately captured Frith's conceptualization.

Follow-Up Analyses

In order to examine the results seen in the second hypothesized analysis, a follow-up analysis was designed to further explore the predictive effects of external and internal distraction on disorganized symptoms. A measure of competing external stimuli was derived by a "distraction score". The distraction score was derived from those subtests of the Ruff Figural Fluency test which have extraneous visual stimuli which serves to increase external distraction when performing the task. This study revealed that this external distraction variable predicted disorganized symptoms but not negative, positive, or perseverative.

This finding supports Frith's theory in part. He hypothesized that people with predominantly disorganized symptoms are susceptible to distraction causing them to make errors. Internal distraction was not adequately tested by the combination of tests within

the conglomerate score of incorrect responses. Therefore, to examine potential internal distraction further, a follow-up test using the Design Fluency free and fixed measures was conducted.

The follow-up test utilized the free and fixed trials of the Design Fluency test to attain an "internal distraction score". This score determined whether the addition of rules would tax internal distraction and, therefore, illicit more errors which would better predict the disorganized symptoms score. This test should have adequately tapped internal distraction. Despite the use of this purported measure of distraction, the internal distraction score was found not to predict disorganized symptoms. Thus, it appears that external, but not internal distraction, predicts disorganized symptoms. This exemplifies a breakdown in the route of willed action whereby goals fail to terminate ongoing external stimulus generated actions. However, it appears that internal distraction does not cause a breakdown in the route of willed action. Thus, Frith's model of distraction and its effect on disorganized symptoms requires specification of the source of distraction (e.g., internal vs. external). It is only in the presence of external distraction that disorganized symptoms achieve the anticipated breakdown. As such, the utility of using fluency measures to assess for this type of symptom may be limited only to those tests which utilize competing external stimuli.

Demographic characteristics of patients with schizophrenia are often not controlled for or acknowledged and can serve to confuse the interpretation of findings in neuropsychological studies of the disorder (Blanchard & Neale, 1994). Performance on neuropsychological measures may be significantly related to age and education (Heaton, Grant, & Mathews, 1986). In order to address these issues, follow up analyses were

conducted to include the variable of Estimated IQ, which included age and education as part of the scoring criteria, with the originally designed multiple regression blocks. In addition, the Calgary Depression Scale score was also included with the originally designed multiple regression analyses as it was found to correlate significantly with a number of the dependent variables. The Estimated IQ and Calgary depression scores were added to the fluency measures, Correct score, Perseverative score, and Incorrect score. The combined demographic and fluency performance variables were then used as predictor variables and examined for relationships with the dependent variables of negative symptoms score (SAN mean), perseverative symptoms score (PER mean), disorganized symptoms score (DIS mean), and positive symptoms score (SAP mean).

The results of the follow up analysis with SAN mean as the dependent variable were not significant for either the first or second models. The primary hypothesis, which included only the fluency measures, demonstrated a significant negative correlation between Correct score and SAN mean, as was hypothesized. The contribution of the demographic variables to the fluency variables suggested that the addition of the combined effects of estimated IQ and depression scores cancelled the previously significant relationship. Examination of the correlation matrix between the demographic variables and the dependent variables (Table 6), revealed that the Estimated IQ score and the Calgary Depression Score did not significantly correlate with the negative symptoms score (SAN mean). Therefore, the cause for the nonsignificant follow-up result may be that the addition of intellect and depression scores reduced the predictive influence of the correct score with regard to its relationship with negative symptoms.

The results of the follow-up analysis with PER mean as the dependent variable were significant but the change in R^2 was not significant. The primary hypothesis, including only the fluency measures, was not significant. The follow-up result, therefore, indicated that the demographic variables were predictive of perseverative symptoms, but that the predictive power of the fluency variables was not significant when controlling for the influence of the demographic variables. Results of the correlations between the demographic and dependent variables, seen in Table 6, show that estimated IQ was not significantly correlated with PER mean but the depression score was highly correlated with PER mean. Therefore, it appears that the effects of the depression score likely bolstered the predictive power of the demographic variables. This result suggests that depression scores have a significant positive predictive effect on perseverative symptoms. It would appear that depression scores serve as a better predictor of perseverative symptoms than does perseverative errors on fluency measures.

The results of the follow-up analysis with DIS mean as the dependent variable were also significant but, again, the change in R^2 was not significant. The primary hypothesis, including only the fluency measures and the vocabulary T score, was not significant. This result indicates that the demographic variables were predictive of disorganized symptoms and that the fluency variables were not influential in their predictive power when controlling for the demographic variables. Results of the correlations between the demographic variables and the disorganized symptoms score, seen in Table 6, show that estimated IQ was highly significantly correlated with DIS mean and the depression score was also correlated with DIS mean. Therefore, it appears that the effects of the combined estimated IQ and depression scores made the block of

demographic variables significant. This result suggests that as a decrease in intelligence scores and an increase in depression scores significantly predict disorganized symptoms. It would appear that the combined effects of estimated IQ and depression scores, serve as better predictors of disorganized symptoms than do incorrect responses on fluency measures as was hypothesized.

Finally, the results of the follow-up analysis with positive symptoms (SAP mean) as the dependent variable were significant for both models. The primary analysis, including only the fluency measures was not significant. The primary analysis result was consistent with hypothesized results that positive symptoms would not correlate with any of the predictor variables. The follow-up analysis result suggests that the addition of the demographic variables produced significant predictive relationship with regard to positive symptoms and enhanced the predictive power of the fluency variables as well. Table 6 reveals the correlations between the demographic variables and the positive symptoms score. It can be seen that estimated IQ was not significantly correlated with SAP mean but the depression score was highly correlated with SAP mean. Therefore, it appears that the depression score made the entire block of variables, including the formerly nonsignificant fluency measures, significant. It would appear that the depression score, serves as substantial predictor of positive symptoms.

In keeping with previous studies which have said that positive symptoms of schizophrenia do not correlate with cognitive dysfunction, it was hypothesized that positive symptoms would not correlate with poor performance on fluency measures and would, therefore, make a good control variable for this study. Its significant positive correlation with depression scores in the follow-up analysis does not necessarily diminish

its utility as a control variable for future studies. It does, however, suggest that when using positive symptoms as a control variable, any concurrent depression should be controlled for as a potential confound.

These follow-up analyses were conducted in an effort to address previously under-evaluated salient demographic variables, and their potential confounding effects on neuropsychological test performance and their predictive capacity for symptoms of schizophrenia. These results reveal that variables such as intellect and depression level may have as good or better capacity to predict discrete symptoms of schizophrenic than does neuropsychological test performance. Further evaluation of these demographic factors appears warranted.

Overall, the results of this study did not support much of Frith's model of deficits in willed intention, particularly when demographic variables where included in the analyses. Negative symptoms were not significantly negatively correlated with a poverty of responding, perseverative symptoms were significantly positively correlated with inappropriate repetitive responding, and disorganized symptoms were significantly positively correlated with stimulus driven erroneous responding over and above the influence of the demographic variables. The hypothesized breakdowns which account for behavioral abnormalities, according to Frith, occur along the pathways of initiation and inhibition of self-generated and stimulus-generated responding. The breakdowns in these routes of willed intention were not helpful in predicting observed symptom expression seen in schizophrenia. Based on this data, it is speculated that metacognitive processes of action intention, sustained initiation, and behavioral and stimulus monitoring implicated in Frith's model, may not be the best processes to predict symptom expression. Although,

the more global cognitive mechanisms of attention and automatic processing on which Frith's model is built may still have merit in understanding symptom subtypes in schizophrenia.

CHAPTER VI

RESEARCH AND CLINICAL IMPLICATIONS

The model of Willed Intention in schizophrenia is a model whereby individuals demonstrate goal formation which leads to willed intention to create an action which will lead to an observable behavioral action that must be appropriate to a given stimulus or test parameter. The primary environment to test this ability is one where individuals must self initiate a response for a sustained period of time. This will test their capacity for intention formation. The response must be goal oriented which will demonstrate their ability to meet the parameters of the task. Finally, the response must be accurate in order to assess their ability to inhibit external stimuli, inhibit internal stimuli, and will demonstrate their ability to terminate an action once it becomes inappropriate.

The utility of using fluency measures, as opposed to other types of neuropsychological measures, is that fluency measures provide a relatively ambiguous environment whereby the participants must self generate a response. Patients are given few parameters for what constitutes an appropriate response which will assess their ability to formulate goals. In addition, these measures can yield scores of perseverative as well as rule violating errors which may assess symptoms of perseveration or disorganization in patients with schizophrenia. This study utilized neuropsychological fluency measures which are available to clinicians, have been tested with clinical populations, and which may aid in the ability of neuropsychologists to make predictions of symptom type seen in patients referred with schizophrenia. The advances and limitations within this study as well as future clinical and research implications are discussed below.

Research Implications

This study was designed to examine symptoms seen in schizophrenia as discussed by Frith (1992). The population of patients used for this data set came from six different locations and included three types of treatment facilities, in-patient, out-patient, and day treatment. The number of individuals on medications included 89 percent of the total data set. Of the 71 participants in the study only 11 percent were on an in-patient unit at the time of testing. Overall, this data set represented relatively well functioning people with schizophrenia. The mean age of participants was 37 years old at time of testing. The mean estimated IQ was 89 and the mean of the data set for depression scores was in the normal range. Overall, these demographics tend to suggest that most of the participants in this study represent people with schizophrenia who are relatively well functioning.

The use of neuroleptic medications has been acknowledged as a potentially serious confound in neuropsychological research of the disorder of schizophrenia (Spohn & Strauss, 1989). It is suspected that the patients used in this study, most of whom were medicated and stable in the community, may not have adequately captured a full picture of the array of schizophrenic symptoms. Frith's model necessitates the quantifiable expression of several symptom types in order to test the predictive power of neuropsychological instruments. The effects of neuroleptic medications may have served to equalize the symptom types and may have contributed to the results seen in these analyses. Symptom severity does not appear to have been a problem. An examination of the data illustrated an adequately large range of scores on symptom measures. Therefore,

the neutralizing of the array of symptoms, not a narrow range of symptom severity, may have been the more likely explanation for the overall effects seen.

Future research might be better served if neuroleptic naive patients with schizophrenia are utilized. These patients may better exemplify the symptoms which illustrate the hypothesized breakdown in metacognitive processes that Frith's model presumes. As such, the use of neuropsychological fluency measures should adequately predict symptom type and lead to a better understanding of the heterogeneity of discrete symptoms of schizophrenia. It should be noted, however, that neuroleptic naive patients would not adequately represent the schizophrenic community. The treatment of choice for the disorder is the use of adjunctive medications and the vast majority of people with schizophrenia are medicated. A study conducted by Saykin et al., (1991) utilized neuroleptic naive participants to assess neuropsychological function. Such studies, however, are rare and may present other methodological issues.

Finally, follow-up analyses in this study exemplified the predictive power of demographic variables such as estimated intelligence and depression level with regard to symptom type. Future studies might be well served if they control for these variables. It would appear that these salient factors serve good predictive utility. When studying a model, such as Frith's, which does not account for demographic variable influence on schizophrenia symptomology, it may be best to equalize the sample group with regard to estimated intelligence and depression level.

Clinical Implications

Neuropsychological measures were found to be somewhat clinically useful in aiding in the understanding of the disorder. Suspected problems with the fluency

measures selected for this study include the potential floor effect of eliciting errors. Several of the measures did not have a distraction component in them. As such, they may not have comprehensively assessed the potential for people with disorganized symptoms to inhibit competing external stimuli. Fluency measures used to assess disorganized symptoms should incorporate visual or auditory distracting stimuli during task performance. Aside from subtests on the Ruff Figural Fluency test, many of the fluency measures used clinically, do not have this distraction component. As Frith's model calls for a close examination of the amount and type of errors seen on fluency measures, this is an important consideration for future research of his model.

In addition, the SCL-90-R may not have been appropriate to assess perseverative symptoms which served as one dependent variable. While it was designed to assess obsessive-compulsive symptoms, it may have lower construct validity in assessing perseveration of thought and behavior seen in schizophrenia. Also, a number of criticisms have been made of utilizing self report measures with people with schizophrenia. Issues with confusion and, often times, poor reality testing are thought to make it difficult for them to respond in a reliable manner to self report questions (Foster & Done, 1986). Better instruments to evaluate perseverative symptoms are behavioral measures which observe overt behavioral expression of repetitive speech or action. An example of such an instrument is the Nurses' Observation Scale for Inpatient Evaluation (Honigfeld, Gillis, & Klett, 1966). This instrument was developed to assess therapeutic change in older adults with schizophrenia. It was designed to be used on in-patient psychiatric units and utilizes frequency counts of specific behaviors which load on different factors. This instrument does not have a specific perseveration factor but it does have Manifest Psychosis factor

which includes behaviors of repetitive speech and physical posturing which may suggest the presence of perseverative behaviors.

The benefit of using fluency measures for prediction of discrete symptoms seen in schizophrenia is that a number of them are available clinically. The Controlled Oral Word Association Test and the Ruff Figural Fluency have been standardized and can provide normative data by which meaningful predictions might be made of patients with schizophrenia referred for evaluation. The Design Fluency Test and the Alternate Uses Test have been used more experimentally and do not have standardized data by which to make determinations about performance.

The findings of this study may contribute to treatment implications as well. The utility of using neuropsychological instruments to predict symptom types may help clinicians make recommendations with regard to psychotherapeutic and psychopharmacological issues. Knowledge about predominant symptom type may aid psychiatrists in determining the best neuroleptic medication for the patient . For instance, Clozapine has been found to have salutary effects on attention and response speed in people with predominantly positive symptoms while Risperidone has been suggested to be helpful speech and motor slowing seen in negative symptoms (Daniel, Goldberg, Weinberger, Kleinman, Pickar, Lubick, & Williams, 1996). Prediction of symptom type based on these measures may help in making treatment recommendations for appropriate therapies as well.

APPENDIX A

SCALE FOR ASSESSMENT OF NEGATIVE SYMPTOMS/ SCALE FOR ASSESSMENT OF POSITIVE SYMPTOMS

Scale for Assessment of Positive Symptoms/Scale for Assessment of Negative Symptoms (Adapted from: Andreasen, N. C. (1984). Scale for the assessment of negative symptoms/scale for the assessment of positive symptoms [Manual]. Iowa City, IA)

0=None	1=Questionable	2=Mild	3=Moderate	4=Marked	5=Severe
Auditory Hallucination	0	1	2	3	4	5
Voices Commenting	0	1	2	3	4	5
Voices Conversing	0	1	2	3	4	5
Somatic or Tactile Hallucinations	0	1	2	3	4	5
Olfactory Hallucinations	0	1	2	3	4	5
Visual Hallucinations	0	1	2	3	4	5
Global Rating of Hallucinations	0	1	2	3	4	5
Persecutory Delusions	0	1	2	3	4	5
Delusions of Jealousy	0	1	2	3	4	5
Delusions of Guilt or Sin	0	1	2	3	4	5
Grandiose Delusions	0	1	2	3	4	5
Religious Delusions	0	1	2	3	4	5
Somatic Delusions	0	1	2	3	4	5
Delusions of Reference	0	1	2	3	4	5
Delusions of Being Controlled	0	1	2	3	4	5
Delusions of Mind Reading	0	1	2	3	4	5
Thought Broadcasting	0	1	2	3	4	5
Thought Insertion	0	1	2	3	4	5
Thought Withdrawal	0	1	2	3	4	5
Global Rating of Delusions	0	1	2	3	4	5
Unusual Clothing and Appearance	0	1	2	3	4	5
Social and Sexual Inappropriateness	0	1	2	3	4	5
Aggressive or Agitated Behavior	0	1	2	3	4	5
Repetitive or Stereotyped Behavior	0	1	2	3	4	5
Global Rating of Bizarre Behavior	0	1	2	3	4	5
Thought Derailment	0	1	2	3	4	5
Tangentiality	0	1	2	3	4	5
Incoherence	0	1	2	3	4	5
Illogicality	0	1	2	3	4	5
Circumstantiality	0	1	2	3	4	5
Pressure of Speech	0	1	2	3	4	5
Distractible Speech	0	1	2	3	4	5
Clanging	0	1	2	3	4	5
Global Rating of Thought Disorder	0	1	2	3	4	5

SANS/SAPS continued.

Unchanging Facial Expression	0	1	2	3	4	5
Decreased Spontaneous Movements	0	1	2	3	4	5
Paucity of Expressive Gestures	0	1	2	3	4	5
Poor Eye Contact	0	1	2	3	4	5
Affective Nonresponsivity	0	1	2	3	4	5
Lack of Vocal Inflections	0	1	2	3	4	5
Global Rating of Affective Flattening	0	1	2	3	4	5
Inappropriate Affect	0	1	2	3	4	5
Poverty of Speech	0	1	2	3	4	5
Poverty of Content of Speech	0	1	2	3	4	5
Blocking	0	1	2	3	4	5
Increased Latency of Response	0	1	2	3	4	5
Global Rating of Alogia	0	1	2	3	4	5
Grooming and Hygiene	0	1	2	3	4	5
Impersistence at Work or School	0	1	2	3	4	5
Physical Anergia	0	1	2	3	4	5
Global Rating of Avolition-Apathy	0	1	2	3	4	5
Recreational Interests and Activities	0	1	2	3	4	5
Sexual Activity	0	1	2	3	4	5
Ability to Feel Intimacy, Closeness	0	1	2	3	4	5
Relationships with Friends and Peers	0	1	2	3	4	5
Global Rating of Asociality	0	1	2	3	4	5
Social Inattentiveness	0	1	2	3	4	5
Inattentive at Mental Status Exam	0	1	2	3	4	5
Global Rating of Attention	0	1	2	3	4	5

APPENDIX B

CONTROLLED ORAL WORD ASSOCIATION TEST

Controlled Oral Word Association Test
(Adapted from: Benton, A. L., Eslinger, P. J., & Damasio, A. R. (1981). Normative observations on neuropsychological test performance in old age. Journal of Clinical Neuropsychology, 3, 33-42).

Instructions:

I'm going to say to you a letter of the alphabet. After I do, I want you to tell me as many words as you can think of that begin with that letter. There are only two rules. One, you are not allowed to say any words that are proper nouns or begin with a capital letter. So no names of people like "Ralph" or places like "Rome". Second, you cannot use a form of a word you've already said. For example, if the letter were "R", you could say "Run" but then you could not say "Running". If there are no questions, we can begin.

Tell me as many words as you can think of that begin with the letter F. (Timed for one minute). Tell me as many words as you can think of that begin with the letter A. (Timed for one minute). Tell me as many words as you can think of that begin with the letter S. (Timed for one minute).

Now I'm going to say to you the name of a category. I want you to say as many words as you can think of that belong in that category. Ready? Tell me all the Animals you can think of. (Timed for one minute). Tell me all the Vegetables you can think of. (Timed for one minute). Tell me all the Parts of a House you can think of. (Timed for one minute).

APPENDIX C

ALTERNATE USES TEST

Alternate Uses Test

(Adapted from: Guilford, J. P., Christensen, P. R., Merrifield, P. R., & Wilson, R. C. (1978). Alternative uses: Manual of instructions and interpretation. Orange, CA: Sheridan Psychological Services.

Instructions:

I'm going to ask you to give me as many different alternate uses as you can think of for some common items. You will have four minutes to do this. For example, alternate uses for a newspaper would be; to line a shelf, to make a hat, to wrap a fish, etc. Now I will say three items one at a time and you say as many different alternate uses for them as quickly as possible. Ready? Pencil... Tire... Eyeglasses... (Each timed for one minute twenty seconds).

Very good. Now I'm going to say three more common items and you say as many different alternate uses for them as quickly as possible. Ready? Shoe... Key... Button... (Each timed for one minute twenty seconds).

APPENDIX D

DESIGN FLUENCY TEST

Design Fluency Test

(Adapted from: Jones-Gotman, M., & Milner, B. (1977). Design fluency: The invention of nonsense drawings after focal cortical lesions. Neuropsychologia, 15, 653-674).

Instructions:

In the space below, you are to invent as many different drawings that represent neither actual nor nameable objects. Remember, you are to create a different design each time. You will have five minutes to do this so work as quickly as possible. Begin when you are ready. (Illustrate examples).

Very good. Now, in the space below, you are to invent as many different drawings that represent neither actual nor nameable objects but you must use four and only four lines to draw them. Remember to create a different design each time. You will have four minutes to do this so work as quickly as you can. Begin when you are ready. (Illustrate examples).

APPENDIX E

RUFF FIGURAL FLUENCY TEST

Ruff Figural Fluency Test

(Adapted from: Ruff, R. M. (1988). Ruff figural fluency test administration manual. San Diego, CA: Neuropsychology Resources).

Instructions:

In front of you are three squares each containing five dots. Note that the arrangement of the five dots is always the same. In each square, I want you to connect two or more dots by always using straight lines. The purpose of this test is for you to make as many designs as possible—but each design has to be different in some way from all the others. (Give feedback about errors on the sample).

On this page, draw as many different designs as possible. Start in the upper left square and work from left to right. (Point out order). Just connect at least two dots in each square with a straight line-and remember, work as quickly as possible-make every design different. Ready? Go. (Repeat this paragraph of instructions for each of the five pages). See the following pages for the sample tests.

APPENDIX F

SHIPLEY INSTITUTE OF LIVING SCALE

Shipley Institute of Living Scale

(Adapted from: Zachary, R. A. (1986). Shipley Institute of Living Scale: Revised Manual. Los Angeles: CA, Western Psychological Services).

Instructions:

In the test below, the first word in each line is printed in capital letters. Opposite it are four other words. Circle the one word which means the same thing, or most nearly the same thing, as the first word. If you don't know, guess. Be sure to circle the one word in each line that means the same thing as the first one. (Stop test at ten minutes).

EXAMPLE:

LARGE	red	big	silent	wet

TALK	draw	eat	speak	sleep
PERMIT	allow	sew	cut	drive
PARDON	forgive	pound	divide	tell
COUCH	pin	eraser	sofa	glass
REMEMBER	swim	recall	number	defy
TUMBLE	drink	dress	fall	think
HIDEOUS	silvery	tilted	young	dreadful
CORDIAL	swift	muddy	leafy	hearty
EVIDENT	green	obvious	skeptical	afraid
IMPOSTOR	conductor	officer	book	pretender
MERIT	deserve	distrust	fight	separate
FASCINATE	welcome	fix	stir	enchant
INDICATE	defy	excite	signify	bicker
IGNORANT	red	sharp	uninformed	precise
FORTIFY	submerge	strengthen	vent	deaden
RENOWN	length	head	fame	loyalty
NARRATE	yield	buy	associate	tell
MASSIVE	bright	large	speedy	low
HILARITY	laughter	speed	grace	malice
SMIRCHED	stolen	pointed	remade	soiled
SQUANDER	tease	belittle	cut	waste
CAPTION	drum	ballast	heading	ape
FACILITATE	help	turn	strip	bewilder
JOCOSE	humorous	paltry	fervid	plain
APPRISE	reduce	strew	inform	delight
RUE	eat	lament	dominate	cure
DENIZEN	senator	inhabitant	dominate	cure
DIVEST	dispossess	intrude	rally	pledge
AMULET	charm	orphan	dingo	pond
INEXORABLE	untidy	involatile	rigid	sparse
SERRATED	dried	notched	armed	blunt
LISSOM	moldy	loose	supple	convex

Shipley Institute of Living Scale continued

MOLLIFY	mitigate	direct	pertain	
ORIFICE	brush	hole	building	lute
QUERULOUS	maniacal	curious	devout	complaining
PARIAH	outcast	priest	lentil	locker
ABET	waken	ensue	incite	placate
TEMERITY	rashness	timidity	desire	kindness
PRISTINE	vain	sound	first	level

PART II:

Instructions:

Complete the following by filling in either a number or a letter for each dash (__). Do the items in order, but don't spend too much time on any one item.

EXAMPLE:

A B C D _____

(1) 1 2 3 4 5 ___
(2) white black short long down ___ ___
(3) AB BC CD D ___
(4) Z Y X W V U ___
(5) 12321 23432 34543 456 ___ ___
(6) NE/SW SE/NW E/W N/ ___
(7) escape scape cape ___ ___ ___
(8) oh ho rat tar mood ___ ___ ___ ___
(9) A Z B Y C X D ___
(10) tot tot bard drab 537 ___ ___ ___
(11) mist is wasp as pint in tone ___ ___
(12) 57326 73265 32657 26573 ___ ___ ___ ___ ___
(13) knit in spud up both to stay ___ ___
(14) Scotland landscape scapegoat ___ ___ ___ ___ ee
(15) surgeon 123456 snore 17635 rogue ___ ___ ___ ___ ___
(16) tam tan rib rid rat raw hip ___ ___ ___
(17) tar pitch throw saloon bar rod fee tip end plank ___ ___ ___ ___ ___ meals
(18) 3124 82 73 154 46 13 ___
(19) lag leg pen pin big bog rod ___ ___ ___
(20) two w four r one o three ___

APPENDIX G

CALGARY DEPRESSION SCALE

Calgary Depression Scale

(Adapted from: Addington, J. & Addington, D. (1993). Premorbid functioning, cognitive functioning, symptoms and outcome in schizophrenia. Journal of Psychiatric Neuroscience, 18, 8-23).

Instructions:

This instrument is an interview style assessment of depressive symptoms seen in patients with schizophrenia. The following questions are asked of the participants and a score is given based on their verbal responses to the questions. Question 9 is the interviewer overall impression of the level of depression seen in the patient.

All questions are followed by a four point scale:

0 - Absent, 1 - Mild, 2 - Moderate, 3 - Severe

1. Depression-how would you describe you mood over the last 2 weeks: Do you keep reasonably cheerful or have you been very depressed or low spirited recently? In the last 2 weeks how often have you (own words) every day? All day?
2. Hopelessness-How do you see the future for yourself? Can you see any future? or has life seemed quite hopeless? Have you given up or does there still seem some reason for trying?
3. Self depreciation-What is your opinion of yourself compared to other people? Do you feel better or not as good about the same as most? Do you feel inferior or even worthless?
4. Guilty ideas of reference-Do you have the feeling that you are being blamed for something or even wrongly accused? What about (Do not include justifiable blame or accusation. Exclude delusions of guilt).
5. Pathological guilt-Do you tend to blame yourself for little things you may have done in the past? Do you think you deserve to be so concerned about this?
6. Morning depression-When you have felt depressed over the last 2 weeks have you noticed the depression being worse at any particular time of the day?
7. Early wakening-Do you wake earlier in the morning than is normal for you? How many times a week does this happen?
8. Suicide-Have you felt that life wasn't worth living? Did you ever feel like ending it all? What did you think you might do? Did you actually try?
9. Observed depression-Based on the interviewer's observations during the entire interview. The questions "Do you feel like crying?" used at appropriate points in the interview may elicit information useful to the observation.

APPENDIX H

SYMPTOM CHECKLIST-90-REVISED

Symptom Checklist -90-Revised

(Adapted from: Derogatis, L. R. (1983). SCL-90-R administration, scoring, & procedure manual-II. Townes, MD: Clinical Psychometric Research).

Instructions:

Below is a list of problems people sometimes have. Please read each one carefully and blacken the circle that best describes HOW MUCH THAT PROBLEM HAS DISTRESSED OR BOTHERED YOU DURING THE PAST 7 DAYS INCLUDING TODAY. Blacken the circle for only one number for each problem and do not skip any items. If you change your mind, erase your first mark carefully. Read the example before beginning.

EXAMPLE: Bodyaches

0 Not at all
1 A little bit
2 Moderately
3 Quite a bit
4 Extremely

(Included here are only the items used in determining the Obsessive-Compulsive factor scale which was used in this study).

1. Repeated unpleasant thoughts that won't leave your mind
2. Trouble remembering things
3. Worried about sloppiness or carelessness
4. Feeling blocked in getting things done
5. Having to do things very slowly to insure correctness
6. Having to check and double check what you do
7. Difficulty making decisions

Your mind going blankTrouble concentrating 10. Having urges to beat, injure, or harm someone

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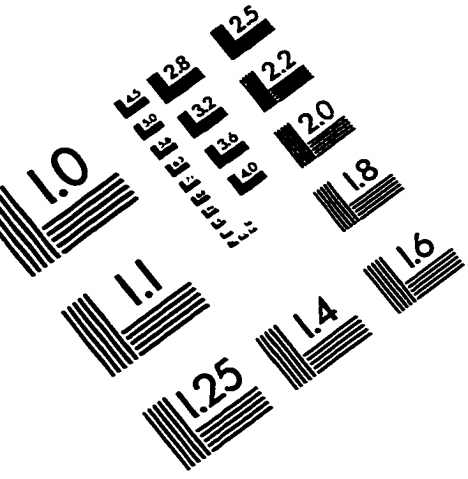
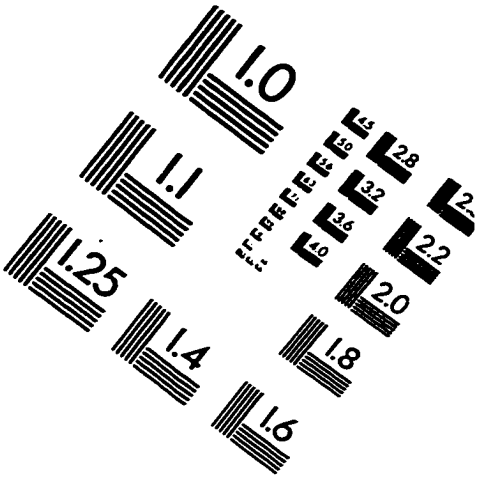
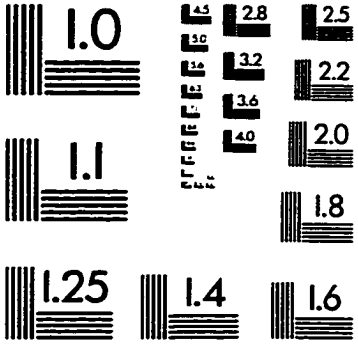
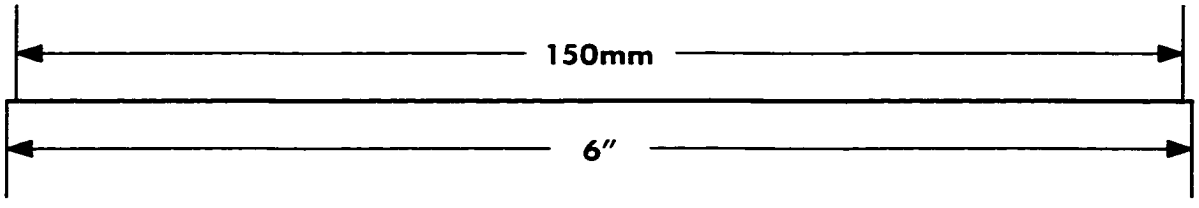
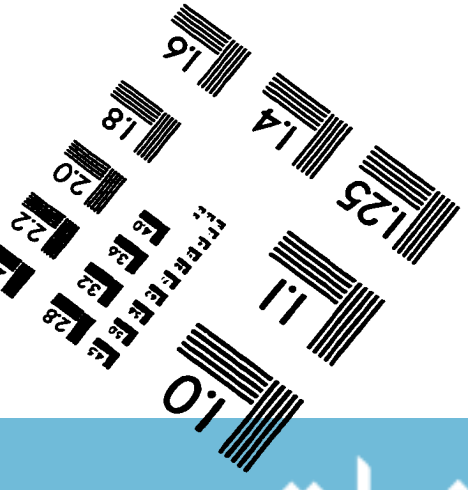
IMAGE EVALUATION TEST TARGET (QA-3)

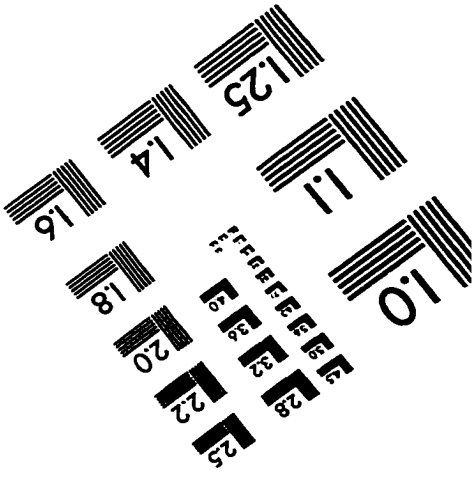












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