NEUROPSYCHOLOGICAL CORRELATES OF SYNDROMES OF SCHIZOPHRENIA

A Thesis

Presented to

The Faculty of the Department of Psychology

The College of William & Mary in Virginia

In Partial Fulfillment

Of the Requirements of the Degree of

Master of Arts

---

by

Preston Scott Eckman

1997

APPROVAL SHEET

This thesis is submitted in partial fulfillment of

the requirements for the degree of

Master of Arts

Scott Eck

Author

Approved April, 1997

Glenn D. Shean

Glenn D. Shean, Ph.D.

W. Larry Ventis

W. Larry Ventis, Ph.D.

Donna K. Moore Psy.D

Donna Klinefelter Moore, Psy.D.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

I thank Dr. Glenn Shean for the assistance and guidance that he has provided throughout my time at William and Mary. He was especially helpful in assisting with the development and submission of several versions of a manuscript from an earlier study that we conducted together. In addition to his guidance on two major research projects, he has been a good friend and mentor, and has provided advice concerning other areas of my graduate performance and future plans.

I thank Dr. Larry Ventis and Dr. Donna Moore for helpful advice and editing of this manuscript. Dr. Moore was very helpful in the development of the training procedures that were administered in this study. Rebecca Plesko was very helpful in gaining access to wards at Eastern State Hospital and in early stages of data collection. I am indebted to Traverse Burnett for his dedication to this project. He has provided many long hours of data collection, data entry, and editing, and he has shown an eagerness to conduct sound Psychological research. Best wishes to his future.

Dr. Harvey Langholtz, my teaching advisor for the last two years, did not play a role in the development of this study, but he has been a great friend and advisor. He has shown a confidence in my abilities and has supported me in all of my future planning. I have learned a great deal about professionalism and hard work through Dr. Langholtz's direction.

I am grateful to my parents, Richard and Darlene Eckman, for their support over the last 24 years. The confidence that they have instilled in me has carried me through many hard times.

LIST OF TABLES

ABSTRACT

In an attempt to segregate schizophrenic patients into more homogeneous symptom groups, researchers have proposed three syndromes (Andreasen et al., 1995; Liddle, 1987a). The validity of these three syndromes has been supported by findings that the three exhibit disparate patterns of neuropsychological functioning (Liddle 1987b; Liddle et al., 1989) Additionally, Green et al. (1991) has found that performance of some schizophrenic patients can be remediated with coaching and incentive (motivation). Because some patients are unable to improve, Green et al. (1991) suggests that "learners" and "nonlearners" may reflect different etiological sub-types. The purpose of this study was to validate the supposition that disorganization syndrome is associated with impaired performance on neuropsychological tests of attention, memory, and executive function, compared to negative and psychoticism syndromes (Liddle 1987b; Andreasen et al., 1995).

Participants were inpatients from a large state hospital. Schizophrenic symptoms were assessed using the SANS/SAPS. A neuropsychological battery was administered, followed by a step-by-step coaching session for each test and a post-coaching retest session. Syndrome scores were determined according to the suggestions of Andreasen et al. (1995). Multiple regression analyses found that disorganization syndrome was the only significant predictor of test performance and improvement after coaching.

The results suggest that disorganization syndrome is associated with poorer neuropsychological performance that is less likely to be remediated by coaching and may represent a distinct syndrome. It may represent more severe underlying deficits than negative and psychoticism syndromes.

NEUROPSYCHOLOGICAL CORRELATES OF SYNDROMES OF SCHIZOPHRENIA

Introduction

Recently researchers have attempted to segregate schizophrenic symptoms into more reliable and valid homogeneous subtypes. Although schizophrenia nominally represents a single illness, it appears to be a heterogeneous group of disorders sharing common symptom features and relatively poor outcome (Andreasen, 1985).

Such a disorder, that is etiologically and pathophysiologically heterogeneous, should be referred to as "the schizophrenias", a polythetic construct which diagnoses non-overlapping symptom patterns with a single word, (Andreasen, Arndt, Alliger, Miller, & Flaum, 1995).

Due to the clinically diverse nature of the disorder, Andreasen (1985) asserts that identifying discrete subtypes is of great importance. If the heterogeneity of the disorder is neglected by researchers and if patients are pooled together as a homogenous group, then positive results will be lost when averaged out in such a diverse sample.

Two-Syndrome Concept

In response to such concerns, Andreasen (1982) and Crow (1980) have proposed two discrete sub-categories of schizophrenia. Based on specific pathological processes, chronicity, and response to neuroleptic medications, a two-syndrome concept was proposed to best accommodate symptom features of the illness.

Positive schizophrenia, referred to by Crow (1980) as type I, is characterized by symptoms such as delusions and hallucinations (Andreasen, 1985; Andreasen & Olson, 1982; Carpenter, Heinrichs, & Wagman, 1988; Crow, 1985). Negative schizophrenia, or type II schizophrenia (Crow, 1980), is characterized by symptoms such as affective blunting, alogia, avolition and apathy, anhedonia and asociality, and attentional impairments (Andreasen, 1985; Andreasen & Olsen, 1982; Carpenter et al., 1988; Crow, 1985).

Patients with positive symptoms tend to have acute onset and relatively normal premorbid functioning (Andreasen, 1985), relatively normal intellectual function, good response to antipsychotic medications, and normal brain structure (Andreasen & Olsen, 1982; Carpenter et al., 1988; Crow, 1985).

Negative schizophrenia tends to be characterized by a more insidious onset and poor premorbid functioning, impaired cognitive functioning, poor response to antipsychotic medications, and a chronic deteriorating course (Andreasen, 1985; Andreasen & Olsen, 1982; Carpenter et al., 1988; Crow, 1985). Results of CT scans indicate that patients with negative symptoms tend to possess structural brain abnormalities such as ventricular enlargement and cerebral atrophy (Andreasen & Olsen, 1982).

Liddle (1987a) noted that there tends to be disagreement on the assignment of certain symptoms. Inappropriate affect was included in the group of negative symptoms by Andreasen (1982), but it was considered a positive symptom by Crow (1980). Likewise, there was not consensus on the placement of thought disorders. While some consider derailment and incoherence to be positive

symptoms (Andreasen, 1982; Crow, 1980), others designated these symptoms to the negative symptom group (Lewine, Fogg, & Meltzer, 1983). In response to these discrepancies, Liddle's (1987a) study was designed to explore the validity of the positive-negative dichotomy.

Three Syndrome Concept

Liddle (1987a) performed factor analysis on 15 individual items included in the Scale for the Assessment of Negative Symptoms (SANS; Andreasen, 1984a) and the Scale for the Assessment of Positive Symptoms (SAPS; Andreasen, 1984b). The results of the factor analysis indicated that the symptoms segregated into three syndromes rather than the classic two-syndrome concept. Liddle named these syndromes: psychomotor poverty (blunted affect, poverty of speech, and decreased spontaneous movement), disorganization (inappropriate affect, formal thought disorder), and reality distortion (various delusions and hallucinations).

The psychomotor poverty syndrome is similar to the negative symptom groups designated by Andreasen (1982) and Crow (1980). Likewise, the reality distortion group consists of positive symptoms, delusions and hallucinations. Unlike the psychomotor poverty and reality distortion syndromes which appear to consist of symptoms that have previously been designated as negative or positive, respectively, the disorganization syndrome consists of symptoms that have previously been classified as either negative or positive. That is, in Liddle's (1987a) study a new syndrome emerged out of positive and negative symptom groups.

Although Liddle (1987a) used only 40 participants in his factor analysis, the three syndrome model has been supported in other investigations (Liddle & Barnes, 1990; Malla, Norman, Williamson, Cortese, & Diaz, 1993; Peralta, de Leon, & Cuesta, 1992) with larger samples. Liddle and Barnes (1990), using a sample of 57 patients, found similar results as Liddle (1987a) but assessed positive symptoms with the Manchester scale rather than the SAPS because the Manchester scale is more suitable for severely handicapped patients who cannot tolerate a long interview. Andreasen et al. (1995) used a sample of 243 patients, Malla's et al. (1993) had a sample of 155 patients, and Peralta et al. used a sample of 115 patients.

Other investigators have also reported three syndromes (Andreasen et al., 1995; Arndt, Alliger, & Andreasen, 1991). Andreasen et al.(1995) and Arndt et al. (1991) suggest that the third syndrome is a result of subdividing positive symptoms into more distinct factors. This interpretation is consistent with evidence of the heterogeneity of the positive symptom group, as evidenced by such low internal consistency of SAPS ratings (0.40 - Andreasen & Olsen, 1992; 0.30 - Peralta et al., 1992).

Cognitive performance and localized cortical neurological deficits. The validity of the three syndromes has been established by correlating the symptom patterns with measures of cognitive performance and cortical neurological signs (Liddle 1987b; Liddle & Barnes, 1990; Liddle, Barnes, Morris, & Haque, 1989; Liddle & Morris, 1991; Van der Does, Dingemans, Linszen, Nugter, & Scholte, 1993). Liddle (1987b) examined the relationship between scores on SANS/SAPS,

measures included in a comprehensive battery of neuropsychological tests, and cortical neurological signs. He concluded that each of the three syndromes exhibited a specific pattern of neurological impairment. Psychomotor poverty syndrome was associated with impaired neurological signs and poor performance on tests of conceptual thinking, object naming and long-term memory, (Liddle, 1987b; Liddle et al., 1989) and also slowness of mental activities such as word generation (Liddle & Morris, 1991). Disorganization syndrome was associated with impaired neurological signs, poor concentration, poor performance on tests of immediate recall and word learning, (Liddle, 1987b; Liddle et al., 1989) and impaired ability to inhibit an established but inappropriate response (Liddle & Morris, 1991). Reality distortion syndrome showed very limited neurological impairment, being only weakly correlated with poor figure-ground perception.

The evidence cited by Liddle suggests that the psychomotor poverty and disorganization syndromes are associated with dysfunction at different sites within the prefrontal cortex, and the reality distortion syndrome may reflect temporal lobe dysfunction (Liddle, 1987b; 1989).

Liddle and his colleagues also examined the association between the three syndromes and differential patterns of cerebral blood flow (Liddle et al., 1992). Using positron emission tomography (PET) scanning, the psychomotor poverty and disorganization syndromes were associated with altered perfusions within the pre-frontal cortex, and the reality distortion syndrome was associated with altered perfusions within the temporal lobe. This evidence supports the authors' claim that the syndromes may be associated with different underlying pathological processes.

Studies using the Wisconsin Card Sort Test (WCST) indicate that the disorganized syndrome is associated with impaired performance on the task (Liddle et al., 1989; Liddle & Morris, 1991; Van der Does et al., 1993). The WCST is a test of executive functioning that is thought to be a frontal-lobe task (Milner & Petrides, 1984; Ragland, Gur, Deutsch, Censits, & Gur, 1995). Xenon imaging strengthens the relationship to the prefrontal cortex; blood flow increases in the dorsolateral prefrontal cortex (DLPFC) have been observed during WCST task performance (Berman, Zec, & Weinberger, 1986; Weinberger, Berman, & Zec, 1986).

Attention and Schizophrenia

Recently, four different elements of attention were delineated from an extensive battery of neuropsychological tests (Mirsky, Anthony, Duncan, Ahearn, & Kellam, 1991). Based on data from over 600 participants, a principal components analysis determined which specific tests assess these four factorially independent elements of attention. Mirsky et al. (1989) described the following four elements of attention that were measured by certain tests: 1)Encode, refers to numeric and mnemonic ability - measured by the Digit Span and Arithmetic subtests of the Wechsler Adult Intelligent Scale-Revised (WAIS-R; Wechsler, 1981); 2) Focus/Execute, the visual-perceptual ability to scan stimuli for a target (focus) and an ability to make a verbal or manual response (execute) - measured by the Digit Symbol Sub-test of the WAIS-R, the Stroop Color-Word Interference Test (Stroop, 1935), the Talland Letter Cancellation Test (Talland, 1965); and the Trail Making Test (Reitan & Davison, 1974); 3) Sustain, also known as vigilance,

represents ability to maintain focus and alertness over time - measured by various versions of the Continuous Performance Test (CPT; Rosvold, Mirsky, Sarason, Bransome, & Beck, 1956); and 4)Shift, measures the ability to adaptively change attention and focus in a flexible manner - measured with the WSCT.

More recently, this neuropsychologically based model of the elements of attention has been applied to schizophrenia (Mirsky, Yardley, Jones, Walsh, & Kendler, 1995). In order to determine which attention deficits were most specific to schizophrenia, Mirsky et al. (1995) administered the test battery to four groups: participants with schizophrenia, first-degree relatives of participants with a psychiatric diagnosis other than schizophrenia, first-degree relatives without diagnoses, and age and education matched controls.

Results from Mirsky et al. (1995) indicated that schizophrenic patients performed significantly worse than controls on all measures. The shift element was able to differentiate both relatives and patients from controls; the shift element was the only element able to distinguish relatives without a diagnosis from controls. In turn, the authors propose that the shift element may be the most sensitive to schizophrenic diathesis. The focus/execute element was the only element able to distinguish between the two groups of relatives, and the sustain element was the only element that discriminated between relatives with a diagnosis and schizophrenic patients, suggesting that sustain may be the most sensitive test to schizophrenia.

Motivation Deficits and Schizophrenia

Although schizophrenic individuals perform poorly on the WCST, investigators have questioned whether the deficits in performance were remediable when given explicit card-by-card instructions. Goldberg and his colleagues found that patients receiving incremental information on how to do the test moderately improved but returned to baseline levels when instructions were withdrawn (Goldberg, Weinberger, Berman, Pliskin, & Podd, 1987). Goldberg et al. concluded that patients apparently implemented feedback into their future responses. These results suggest that the deficits in WCST performance may not be remediable, but motivational factors could not be ruled out as a possible explanation.

The results of Goldberg et al. (1987) may be the result of motivational deficits rather than an inability to learn. One notable confound is that the frontal lobes, which are responsible for the performance deficits on the WCST, have been tied to motivational deficits (Summerfelt, Alphs, Funderburk, Strauss, & Wagman, 1991).

In response to Goldberg et al. (1987), investigators tested to determine if schizophrenic patients could learn the WCST when positive incentive (five cents) and more elaborate training were provided (Bellack, Mueser, Morrison, Tierney, & Podell, 1990). Results indicated that incentive alone did not produce significant improvements, but incentive paired with training resulted in performance comparable to normal nonpatients. Furthermore, the patients maintained their improvements on a subsequent day.

Two subsequent studies have shown that motivational incentive and training can increase performance in some patients (Green, Ganzell, Satz, & Vaclav, 1990; Summerfelt et al., 1991). Green et al. (1991) found that when coupling incentive (two cents) with instruction, performance increased significantly as a group. However, the group could be divided into learners and nonlearners because when the instructions were removed only half of the patients retained their improvement. Green et al. suggested that the learners and nonlearners may reflect different etiological subtypes. Summerfelt et al. found improvement in patients when social and monetary reinforcement was given following correct responses. Summerfelt et al. concluded that motivational deficits are at least partially responsible for the WSCT (a frontal lobe task). These results suggest that poor performance on some neuropsychological tasks (e.g., WCST) may be partially due to motivational deficits.

The findings that some patients are able to improve from coaching and incentive while others do not benefit (e.g., Green et al., 1990) suggest that some schizophrenic patients (nonlearners) suffer from an underlying neuropsychological impairment hindering the effects of coaching. Shean and Rowe (1995) found that patients designated as Disorganized evidenced the least improvement on WCST with coaching, as compared to Reality Distortion syndrome and the Psychomotor Poverty syndrome. The results of Shean and Rowe indicate that the disorganization syndrome may represent underlying neurological impairment, while the other two syndromes may represent attentional or motivational deficits.

Statement of Purpose

The current study was designed to test the following predictions:

1) It was predicted that the results of multiple regression analysis would reveal that symptoms of Disorganization (as defined by Andreasen et al., 1995) would significantly predict impaired performance on dependent measures of memory, attention, and executive function before and after coaching.
2) It was predicted that significant post-coaching improvement in performance measures of memory, attention, and executive function would be related to symptoms of Psychoticism, but not Negative or Disorganization syndromes.

Method

Participants

Participants were 51 inpatients recruited from all psychiatric units of Eastern State Hospital, Williamsburg, Virginia. The following criteria were used to recruit volunteers for the study: 1) participants had a current primary chart diagnosis of Schizophrenia or Schizoaffective Disorder, 2) patients were between the ages of 18 and 60 years, 3) patients with a secondary diagnosis of mental retardation, dementia, or probable organic impairment were excluded, and 4) patients with medication changes within the past two weeks were excluded.

The participants included 19 females and 32 males who ranged in age from 19 to 59 years (M = 40.9). Participants' education level ranged from 6 to 16 years (M = 11.13, SD = 1.8). Number of hospitalizations ranged from 1 to 23 (M = 6.16, SD = 4.8). Demographic information on the participants is summarized in Table 1.

The racial composition of the sample was 48.1 % (N = 25) Caucasians, 48.1% (N = 25) African-Americans, and 1.9% (N = 1) Asian-American.

All psychotropic medications, excluding Risperdol and Clozaril, were converted to Chlorpromazine (Thorazine) equivalents using the conversion table of Davis (1976). Because conversion charts do not include the new medications such as Risperdol and Clozaril, mean Thorazine dosages were calculated only for those participants receiving psychotropic medications that are listed on Davis' (1976)

equivalence chart. Of the 30 participants receiving such medications, Thorazine equivalent dosages ranged from 100 mg to 2000 mg per day (M = 660.60). Fifteen patients were receiving Clozaril or Risperdol, but not the convertible drug; Six participants (12%) were not taking any psychotropic medications. Two of the 51 participants were receiving both a Thorazine equivalent drug and Clozaril or Risperdol.

Materials

Demographic Information Form. A participant demographics form was developed to obtain chart information for each participant (see Appendix A). The following information was included in the form: name, ID number, number of hospital admissions, age, date of birth, Axis I. II, and III diagnoses, medications, recent medication changes, PRNs, and AMES (tardive dyskenesia) scores.

Informed Consent Form. Each participant was given an informed consent form to read and sign. The consent form described the nature of the experiment and requested the participant's permission to use the results in the study. The consent form reminded the participants that their participation was voluntary and that the information obtained was confidential. The consent form can be found in Appendix B.

Premorbid Assessment. A modified version of the Premorbid Adjustment Scale (Cannon-Spoor, Potkins, & Wyatt, 1982) was completed by participants (see Appendix C). The original scale consists of 25 questions concerning adjustment at five developmental periods (childhood, early adolescence, late adolescence,

adulthood, and general). The questions target various domains: education, interpersonal relationships, employment, and friendships.

Symptom ratings. The SANS and SAPS (Andreasen, 1984a, 1984b) were used to assess symptom ratings of the patients (see Appendix D). The SANS assesses 20 symptoms segregated into 5 sub-scales (affective flattening, lack of volition, anhedonia, alogia, and attention impairment) and the SAPS assesses 30 symptoms segregated into 4 subscales. The SANS has good internal consistency (0.849 - Andreasen & Olsen, 1982; Andreasen, Flaum, & Swayze, 1990; 0.78 - Peralta et al., 1992). The SAPS has lower internal consistency (0.397 - Andreasen & Olsen, 1982; 0.48 - Andreasen et al., 1990; 0.30 - Peralta et al., 1992). Peralta et al. (1990) proposes that the low internal consistency of the SAPS suggests that the positive syndrome may not be homogeneous.

Neuropsychological testing

The following neuropsychological tests were selected to measure components of Mirsky's attention model.

Trail Making Test (Parts A and B). The Trail Making Test is part of the Halstead-Reitan Neuropsychological Battery (Reitan and Davison, 1974). The Trail Making Test consists of two trials (Parts A and B). In Part A, the participant is presented with a sheet of paper with 25 scattered numbers from 1 to 25 enclosed in circles (see Appendix E). The test requires participants to draw lines connecting circles in numerical order, as quickly as possible. In Part B, the participant is presented a sheet of paper which has 25 scattered circles containing numbers from 1 to 13 and letters from A to L. The test requires the participant to alternately

connect numbers and letters in ascending order 1,A,2,B,3,C...etc. as quickly as possible. The alternation required in Part B requires the participant to inhibit the tendency to move from number to number and from letter to letter. Part B measures a participant's ability to inhibit inappropriate responses, a typical impairment that Stuss and Benson report to be typical in deficits in executive/frontal lobe function (cited in Liddle & Morris, 1991). The dependent variable is the amount of time required to successfully complete each test.

Digit Span. The Digit Span Test is a subtest of the WAIS-R (see Appendix F). This test measures digit span both with forward retrieval and backward retrieval. It is considered to be a measure of both attention and short-term memory. Scores were based on number of items recalled.

Digit Vigilance Test. The Digit Vigilance Test is a manually administered version of the Continuous Performance Test. The Digit Vigilance Test consists of rows of random numbers on a full sheet of paper (see Appendix G). The participant is required to mark through or cross out all 6's as quickly as possible in a 90 second period. The dependent variable is calculated by summing the number of correct responses and subtracting errors made by either marking through an incorrect number or by failing to mark a 6.

Wechsler Memory Scale-Revised, Logical Memory. Story A of the Logical Memory sub-test of the Wechsler Memory Scale-Revised (WMS-R) consists of a short story that is verbally presented to the participant (see Appendix H). Immediately following the presentation, the participant is required to recall as

many details about the story as possible. Words are grouped according to general ideas, and the dependent measure is the number of item groups correctly recalled.

Procedure

Unit charts were reviewed by the experimenters to select those patients who met the selection criteria. Once identified, eligible patients were discussed with the treatment teams to determine capacity to participate appropriately in a one hour test session. In addition, information about particular patients was collected (e.g. aggressive behaviors, what schedules are best for testing a particular patient).

The charts of the participants used in the study were reviewed for the following information: age, education, number of hospitalizations, secondary diagnosis of substance abuse, and current medications.

Eligible participants were asked to volunteer for the study. The participant then set up a time for a test session. Approximately 15 patients declined the request. Volunteers received a soda as a reward for participation.

Interviews. Two examiners administered the interviews and neuropsychological testing. Prior to the start of the study, the examiners were trained by a Clinical Psychologist to administer the SANS and SAPS. The examiners then practiced together during several preliminary interviews to assure adequate inter-rater reliability.

At the beginning of each testing session, the experimenter spoke with the participant for several minutes in order to establish rapport and trust.

After this brief conversation, the informed consent form was read by the participant. The experimenter answered any questions that the participant had and assured the participant that neither the results of the study nor any information discussed during the interview would affect their stay or release from the hospital. Further, the experimenter reminded the participant that participation was voluntary and that, at any time during the session, the participant had the right to take a break or withdraw.

Prior to the neuropsychological testing session, a modified version of the Premorbid Assessment Scale (Cannon-Spoor et al., 1982) was administered in a interview format. The participants were then interviewed using the SANS and SAPS (Andreasen, 1984a, 1984b). In addition to the guidelines provided for the interview, Andreasen (1982, 1984a, 1984b) recommends that the rater gather additional information from the patients' charts and information provided by the care givers (e.g. nursing staff, clinicians). Therefore, following the testing sessions, charts were utilized in completing the ratings; if the charts were incomplete or ambiguous, the staff were asked for assistance. The SANS/SAPS interviews generally require about 15-30 minutes.

Neuropsychological testing. Phase 1 (Baseline Measures) - After the SANS/SAPS interview was completed, the neuropsychological measures were administered in the following order: 1) Logical Memory of the WMS-R; 2) Trail Making Test (Part A); 3) Trail Making Test (Part B); 4) Digit Span sub-test of the WAIS-R (forward); 5) Digit Span sub-test of the WAIS-R (backward); and 6) the

Digit Vigilance Test (the subject is given 90 seconds to complete as much of this test as possible in the time). Phase 1 required approximately 15 minutes.

Phase 2 (Coaching) - After a brief break (approximately 2 minutes), the experimenter praised the participants' performance and encouraged their continued effort. The experimenter conveyed that, although the participant performed well on the tests, coaching may improve the participant's performance. The experimenter then gave step-by-step coaching suggestions to improve performance on each measure. The coaching suggestions were: 1) for the Logical Memory of the WMS-R, the participants were given a copy of the Logical Memory vignette and asked to read Story A aloud. The participants were further instructed that they could attend to specific details which may be central to the story, in order to enhance recall (e.g. the main character, occupation, family, what happened to her); 2) for the Trail Making Test (Part A), the participants were asked to complete a sample test while verbally counting out each number as they connected numbers in the sample test. Thus, it was pointed out that the verbal counting would help the participant stay focused and aware of the next number; 3) for the Trail Making Test (Part B), the participants were asked to verbally pair (chunk) the corresponding number-letter while drawing the connecting lines. It was assumed that verbalization would help the participant grasp the concept of pairing the appropriate letter with a number (e.g. "One-A", "Two-B", "Three-C"); 4) for the Digit Span sub-test of the WAIS-R, the participants are asked to write the numbers following the experimenters presentation. After writing the numbers, the participants were asked to read them back to the experimenter. This procedure was done for both the forward and

backward versions of the test; and 5) for the Digit Vigilance Task, the explication of left to right and right to left line search strategies were further emphasized with the aid of a sheet of paper. The participants were asked to complete 10 lines using a sheet of paper to guide their success from line to line. This paper was forbidden during Phase 3, but the participants were encouraged to use to same technique with a finger or the pencil. Phase 2 requires 10-15 minutes.

Phase 3 (Post-Coaching) - Phase 1 was repeated in the same order.

Following the testing session, the participants were thanked for volunteering and returned to their unit.

Participants were allowed to rest or terminate at any point in the testing session. Additionally, the experimenters were sensitive to any signs of restlessness or anxiety that would signal that the session should be terminated or recessed. Only a couple of participants requested a recess during testing. Fifteen participants terminated during the session.

Syndrome Groupings. SANS and SAPS item ratings were used to determine syndrome scores for the participants. Following Andreasen et al. (1995), the three syndromes were determined by summing the following global SANS/SAPS symptom scores: 1) Disorganization - thought disorder, bizarre behavior, and inappropriate affect; 2) Psychoticism - delusions and hallucinations; and 3) Negative - alogia, affective blunting, anhedonia, and avolition.

Data reduction and statistical analyses. The dependent measures (neuropsychological test scores) were scored as follows: 1) the Logical Memory was scored according to the specifications of the WMS-R manual; 2) the Trail

Making Test (Parts A and B) scores were number of seconds to successful completion of the task; 3) the Digit Span sub-scale of the WAIS-R was converted to a raw score according to WAIS-R specifications; and 4) the Digit Vigilance was scored according to number of lines completed in the 90 second period minus the number of mistakes (i.e. 6's skipped, incorrect numbers marked). For each dependent measure, pre-coaching (baseline) scores, post-coaching scores, and improvement (difference between pre- and post-coaching) scores were calculated. For Logical Memory, Digit Span, and Digit Vigilance, in which a higher score indicated better performance, improvement was calculated by subtracting pre-coaching from post-coaching. This was done to insure that improvement scores would be positive. For Trail Making tests, parts A and B, however, the post-coaching scores were subtracted from the pre-coaching scores. This was done because improvement would be indicated if the dependent variable (time) decreased from pre- to post-coaching.

In order to determine which syndrome scores were predictive of neuropsychological performance, multiple regression analyses were performed on each dependent measure for pre- and post-coaching scores and improvement scores, with the three syndrome (disorganization, psychoticism, and negative) scores used as predictor variables.

Results

Two raters independently assessed 12 participants in the study using the SANS and SAPS. Using the Spearman-Brown formula (Rosenthal & Rosnow, 1991), inter-rater reliability estimates were calculated for the global ratings used to constitute the syndrome scores as well as each syndrome score. Reliability coefficients for the global items were: affective blunting (r = 1.0), alogia (r = 1.0), anhedonia (r = 1.0), avolition (r = 1.0), bizarre behavior (r = 1.0), delusions (r = 1.0), hallucinations (r = 1.0), thought disorder (r = .99), and inappropriate affect (r = .97). Reliability coefficients for the syndrome scores were: Disorganization (r = .99), Psychoticism (r = 1.0), and Negative Syndrome (r = 1.0). Such high inter-rater agreement can be attributed to thorough preparation prior to beginning the study and careful use of the SANS/SAPS guide when scoring each patient.

Gender Differences

In order to determine whether gender differences in syndrome scores existed, independent samples t-tests were performed for each syndrome score. No gender differences were found on any of the three syndrome scores. Gender differences on the dependent measures revealed significant differences for pre-coaching Digit Span (t (49) = 3.33, p < .01), pre-coaching Logical Memory (t (49) = 2.28, p < .05), post-coaching Logical Memory (t (49) = 2.24, p < .05), and post-coaching Trails A (t (49) = -2.73, p < .01) (see Table 2).

Racial Groups

Multivariate Analysis of Variance (MANOVA) revealed that no significant differences were found between racial groups on syndrome scores (Pillais $F = .11$, p = ns). A MANOVA was also performed on pre-coaching scores of the dependent measures in order to determine if there were any race differences on test performance. Again, results indicated that no significant race differences existed on test performance (Pillais $F = .15$, p = ns).

Clinical Diagnosis

No significant differences were found between schizoaffective and schizophrenic patients on the dependent measures (all t's < 1) or syndrome scores (all t's < 1). Only three participants had a secondary diagnosis of substance abuse.

Education Level

Correlations between education level and all dependent test measures were calculated. No significant relationships were found; correlation coefficients ranged from $r = .007$ (Trails A) to $r = .18$ (Digit Span improvement). Pearson correlation coefficients were also calculated for education level and syndrome scores; again, no significant correlations were found between education level and syndrome scores: Disorganization ($r = -.04$, p = ns), Negative ($r = -.01$, p = ns), and Psychoticism ($r = .08$, p = ns).

Number of Hospitalizations

Pearson product-moment correlations revealed non-significant correlations between number of hospitalizations and syndrome scores: Disorganization ($r = -.05$, p = ns) , Negative ($r = -.01$, p = ns), and Psychoticism ($r = -.08$, p = ns). Also,

number of hospitalizations were not found to be correlated with years of education (r = -.09, p = ns) or daily dosages received of medications (r = .12, p = ns). Lastly, none of the dependent variables were significantly correlated with number of hospitalizations.

Medications

For the 30 participants on Thorazine equivalent drugs, Pearson correlation coefficients were calculated for Thorazine mg/day equivalents and the dependent measures. Non-significant correlations were found on all dependent measures except pre-coaching Trails B (r = .37, p = .03) and improvement on Trails B (r = .51, p = .004). The positive correlation found on pre-coaching indicates that as medication dosage increases, so does the time required to complete the test. Keep in mind that increased time indicates poorer performance. Therefore, performance is worse when dosage is higher. The positive correlation found on improvement scores indicates that as dosage increased, number of seconds of improvement in performance on Trails B increased.

Correlations were also calculated for medication dosages and syndrome scores. Results indicated that Thorazine equivalent dosages were not significantly correlated with Psychoticism (r = -.22, p = .24), Disorganization (r = .06, p = .71), or Negative (r = .09, p = .61) symptoms.

Because there are no published conversion tables for Clozaril or Risperdol, further analyses (independent samples t-tests)compared syndrome scores for patients taking any psychotropic medication to those taking no medication. Again, there were no significant differences found on syndrome scores between patients

on medication and those not on medications for any of the three syndromes, (p's > .05).

Premorbid Assessment

The results of the premorbid assessment were not included as data in the study. Due to the bizarre content of the responses of many participants, the experimenters did not feel the information given by the participants was credible. This assessment did prove to be fruitful however, in that this interview enabled the experimenter to establish rapport with the participant.

Syndrome Scores

As previously mentioned, syndrome scores were computed according to Andreasen et al. (1995). Participants were not classified as members of a particular syndrome group, but rather, a syndrome score was calculated for each participant. Because Disorganization syndrome is composed of three SANS/SAPS global rating items (thought disorder, bizarre behavior, inappropriate affect), the maximum score is 15, the minimum is 0; for Psychoticism (hallucinations, delusions) the maximum is 10, the minimum is 0; and for Negative syndrome (alogia, affective blunting, anhedonia, avolition), the maximum is 20, the minimum is 0.

For the entire sample, Negative symptom scores ranged from 0 to 19 (M = 2.67, SD = 3.54), Psychoticism scores ranged from 0 to 9 (M = 4.53, SD = 2.59), and Disorganization scores ranged from 0 to 11 (M = 2.88, SD = 2.96). Pearson product moment correlations revealed a non-significant correlation between Disorganization scores and Psychoticism scores (r = .06, p = ns) and between

Negative syndrome scores and Psychoticism syndrome scores (r = -.20, p = ns). Disorganization syndrome scores were significantly correlated with Negative syndrome scores (r = .40, p = .003).

Individual items that constituted syndrome scores were correlated and can be found in Table 3. The results indicate that the significant correlation between Disorganization scores and Negative factor scores is due to the correlation between global ratings of Bizarre Behavior and scores that constitute Negative syndrome scores (affective flattening, alogia, anhedonia, and avolition). These results correspond to those found by Andreasen et al. (1995).

Dependent Measure Scores

Dependent samples t-tests were performed on pre- and post-coaching scores for each dependent variable to determine whether change scores were significant. The results indicate that post-coaching scores were significantly better than pre-coaching scores on all measures: Logical Memory (t (50) = 8.21, p = .000), Digit Span (t (49) = 2.49, p = .016), Digit Vigilance (t (47) = 4.36, p = .000), Trail Making A (t (50) = 5.5, p = .000), and Trail Making B (t (49) = 5.3, p = .000). Pre- and post-coaching scores, improvement scores, and normative data for all dependent measures are reported in Table 4.

Because the scores for the overall sample do not account for syndrome differences, a median split was performed on Disorganization scores in order to compare performance on the tests of high and low Disorganization. The means of the two groups are reported along with the normative data for each test in Table 5.

Multiple Regression Analyses

Although it would be preferable to perform principal components analysis on the individual SANS/SAPS items in order to derive the factor loadings from this sample, the sample size is too small to confidently perform that analysis. It is recommended that 10 to 20 participants should be included for each variable in a multivariate analysis, suggesting that 100 to 200 participants are required for this study in order to analyze the 10 global items. Further, it has been recommended that a sample of no less that 200 be used for factor analysis (Gorsuch, 1974). Therefore, for the current sample, the items included in Andreasen et al.'s (1995) study have been used to compose the syndrome scores. The syndrome scores will then be used to predict performance on dependent measures using multiple regression analyses.

Multiple regression analysis reveals how much variance can be explained in a given dependent variable by a given set of predictor variables, both combined and separately. The Multiple $\underline{R}$ and $\underline{R^2}$ are indices of the variability in a dependent measure explained jointly by all three variables. The Beta coefficient is an index of the relationship between each predictor (independent) variable and the dependent variable. The semi-partial correlation coefficient ($\underline{sr}$) indicates the amount of unique variance accounted for by each predictor variable.

Simultaneous multiple regression analyses were performed on pre- and post-coaching scores and improvement scores for each dependent measure. Disorganization, Negative, and Psychoticism scores were used as predictor variables.

In interpreting these findings, direction of the beta and semi-partial correlation is important. For measures in which a higher score on the measure indicated better performance (i.e., Logical Memory, Digit Span, Digit Vigilance), a negative value (beta, semi-partial, T-value) indicates that higher syndrome scores are associated with poorer performance (lower scores) on dependent measures. For measures in which a lower score indicated better performance (i.e., Trail Making Test, Parts A and B); however, a negative test statistic (beta, semi-partial correlation, T-value) indicates that higher syndrome scores are associated with better performance (lower scores) on the dependent measure.

Logical Memory. The three syndrome scores accounted for a significant amount of variance in the pre-coaching scores of the Logical Memory, (R = .53, R^2 = .28, $F(3,47) = 6.35$, p = .001). Of the three syndromes, Disorganization was the only predictor to account for a significant amount of variance (Beta = -.55, sr = -.50, t = -4.09, p = .0002). For summary of results, see Table 6, Panel 1.

Similar results were found for post-coaching scores on the Logical Memory test. The three syndrome scores accounted for a significant amount of variance in the post-coaching scores of the Logical Memory, (R = .64, R^2 = .42, $F(3,47) = 11.42$, p = .0001). Of the three syndromes, Disorganization was the only predictor to account for a significant amount of variance alone (Beta = -.62, sr = -.56, t = -5.05, p = .0000). For summary of results, see Table 6, Panel 2.

For improvement scores (post- minus pre-coaching) on the Logical Memory test, however, all three syndromes accounted for unique variance. Together, the three syndrome scores accounted for a significant amount of

variance ($\underline{R}$ = .56, $\underline{R}^2$ = .32, $\underline{F}$(3,47) = 7.53, $\underline{p}$ = .0003). Of the three syndromes, both Disorganization (Beta = -.32, $\underline{sr}$ = -.29, $\underline{t}$ = -2.44, $\underline{p}$ = .01) and Psychoticism syndrome (Beta = .29, $\underline{sr}$ = .28, $\underline{t}$ = 2.39, $\underline{p}$ = .02) scores accounted for a significant amount of variance, but Negative syndrome (Beta = -.23, $\underline{sr}$ = -.20, $\underline{t}$ = -1.72, $\underline{p}$ = .09) scores only approached significance. In interpreting these findings, direction of the beta and semi-partial correlation is important. For Disorganization and Negative syndromes, the negative values indicate that as syndrome scores increase, improvement in performance decreased. Interestingly, for Psychoticism syndrome scores, as scores increased, so did improvement scores. For summary of results, see Table 6, Panel 3.

Digit Span. The three syndrome scores accounted for a marginally significant amount of variance in the pre-coaching scores of the Digit Span test, ($\underline{R}$ = .37, $\underline{R}^2$ = .14, $\underline{F}$(3,47) = 2.56, $\underline{p}$ = .06). Of the three syndromes, Disorganization was the only predictor to account for a significant amount of variance alone (Beta = -.41, $\underline{sr}$ = -.37, $\underline{t}$ = -2.73, $\underline{p}$ = .008). For summary of results, see Table 7, Panel 1.

For post-coaching scores on the Digit Span test, the three syndrome scores accounted for a significant amount of variance in the post-coaching scores of the Digit Span test, ($\underline{R}$ = -.51, $\underline{R}^2$ = -.27, $\underline{F}$(3,46) = 5.67, $\underline{p}$ = .002). Of the three syndromes, Disorganization was the only predictor to account for a significant amount of variance (Beta = -.54, $\underline{sr}$ = -.49, $\underline{t}$ = -3.90, $\underline{p}$ = .0003). For summary of results, see Table 7, Panel 2.

For improvement scores (post- minus pre-coaching) on the Digit Span test, however, all three syndromes together did not account for a significant amount of

variance, ($\underline{R}$ = .29, $\underline{R}^2$ = .08, $\underline{F}$(3,46) = 1.5, $\underline{p}$ = ns). Furthermore, none of the three syndromes contributed significantly to the variance explained, however, Disorganization syndrome approached significance (Beta = -.28, $\underline{sr}$ = -.25, $\underline{t}$ = -1.82, $\underline{p}$ = .07). For summary of results, see Table 7, Panel 3.

Digit Vigilance. The three syndrome scores accounted for a significant amount of variance in the pre-coaching scores of the Digit Vigilance test, ($\underline{R}$ = .54, $\underline{R}^2$ = .29, $\underline{F}$(3,45) = 6.35, $\underline{p}$ = .001). Of the three syndromes, Disorganization was the only predictor to account for a significant amount of variance (Beta = -.48, $\underline{sr}$ = -.44, $\underline{t}$ = -3.52, $\underline{p}$ = .001). For summary of results, see Table 8, Panel 1.

Similar results were found for post-coaching scores on the Digit Vigilance test. The three syndrome scores accounted for a significant amount of variance in the post-coaching scores of the Digit Vigilance test, ($\underline{R}$ = .53, $\underline{R}^2$ = .28, $\underline{F}$(3,44) = 5.67, $\underline{p}$ = .002). Of the three syndromes, Disorganization was the only predictor to account for a significant amount of variance (Beta = -.51, $\underline{sr}$ = -.46, $\underline{t}$ = -3.56, $\underline{p}$ = .0009). For summary of results, see Table 8, Panel 2.

For improvement scores (post- minus pre-coaching) on the Digit Vigilance test, however, all three syndromes together failed to account for a significant amount of variance, ($\underline{R}$ = .20, $\underline{R}^2$ = .04, $\underline{F}$(3,44) = .61, $\underline{p}$ = ns). For summary of results, see Table 8, Panel 3.

Trail Making Test (Part A). The three syndrome scores accounted for a significant amount of variance in the pre-coaching scores of the Trails A test, ($\underline{R}$ = .66, $\underline{R}^2$ = .43, $\underline{F}$(3,47), $\underline{p}$ = .0000). Of the three syndromes, Disorganization was the only predictor to account for a significant amount of variance (Beta = .65, $\underline{sr}$ =

.59, $\underline{t}$ = 5.41, $\underline{p}$ = .0000). Unlike Logical Memory, Digit Span, and Digit Vigilance, where a negative correlation indicates a decrease in performance with an increase in syndrome score, the opposite interpretation must be used for Trails A and B. In the Trail Making Tests, lower scores indicate better, quicker performance. Therefore, the positive beta and semi-partial correlation found in the Disorganization syndrome, indicates that as the syndrome score increases, the amount of time required to finish the test increases (performance decreases). For summary of results, see Table 9, Panel 1.

Similar results were found for post-coaching scores on the Trail Making Test (Part A). The three syndrome scores accounted for a significant amount of variance in the post-coaching scores, ($\underline{R}$ = .61, $\underline{R}^2$ = .38, $\underline{F}$(3,47) = 9.45, $\underline{p}$ = .0001). Of the three syndromes, Disorganization was the only predictor to account for a significant amount of variance (Beta = .61, $\underline{sr}$ = .55, $\underline{t}$ = 4.8, $\underline{p}$ = .0000). For summary of results, see Table 9, Panel 2.

For improvement scores (pre- minus post-coaching) on the Trail Making test (Part A), however, all three syndromes together failed to account for a significant amount of variance, ($\underline{R}$ = .32, $\underline{R}^2$ = .10, $\underline{F}$(3,47) = 1.78 $\underline{p}$ = ns). Furthermore, none of the three syndromes contributed significantly to the variance explained; however, Disorganization syndrome approached significance (Beta = .25, $\underline{sr}$ = .22, $\underline{t}$ = 1.64, $\underline{p}$ = .10). For summary of results, see Table 9, Panel 3.

Trails Making Test (Part B). The three syndrome scores accounted for a marginally significant amount of variance in the pre-coaching scores of the Trail Making Test (Part B), ($\underline{R}$ = .42, $\underline{R}^2$ = .17, $\underline{F}$(3,46) = 3.32, $\underline{p}$ = .02). Of the three

syndromes, Disorganization was the only predictor to account for a significant amount of variance (Beta = .44, sr = .39, t = 2.99, p = .004). For summary of results, see Table 10, Panel 1.

Similar results were found for post-coaching scores on the Trails Making Test (Part B). The three syndrome scores accounted for a significant amount of variance in the post-coaching scores of the Trail Making Test (Part B), ($R = .63$, $R^2 = .40$, $F(3,47) = 10.47$, $p = .0000$). Of the three syndromes, Disorganization was the only predictor to account for a significant amount of variance alone (Beta = .65, sr = .59, t = 5.19, p = .0000). For summary of results, see Table 10, Panel 2.

For improvement scores (pre- minus post-coaching) on the Trail Making Test (Part B), however, all three syndromes together accounted for a significant amount of variance, ($R = .29$, $R^2 = .08$, $F(3,46) = 1.42$, p = ns). Furthermore, none of the three syndromes contributed significantly to the variance explained; however, Disorganization syndrome approached significance (Beta = -.27, sr = -.24, t = -1.71, p = .09). For summary of results, see Table 10, Panel 3.

Discussion

The results of the multiple regression analyses performed on pre-coaching scores supported our hypothesis that Disorganization syndrome (as defined by Andreasen et al., 1995) would significantly predict impaired performance on measures of memory, attention, and executive functioning. Disorganization syndrome was the only syndrome to account for a significant amount of variance in performance on Mirsky's elements of attention. Disorganization syndrome scores accounted for a significant amount of variance on measures of Encoding (Digit Span, Logical Memory), Focus/Execute (Trail Making Test, Parts A and B), and Sustain (Digit Vigilance) (see Tables 6-10, Panel 1). These results are in accord with previous studies that found that Disorganization syndrome scores were associated with poor concentration and poor performance on tests of immediate recall and word learning (Liddle, 1987b; Liddle et al., 1989). The negative beta values for Logical Memory, Digit Span, and Digit Vigilance indicate that as Disorganization syndrome scores increase, test scores (performance) decreases. The positive beta values for the Trail Making Tests (Parts A and B) indicate that as Disorganization syndrome scores increase, time required to complete the tests increases (performance decreases). There are no consistent trends among the five tests on the directions of the beta values for Negative or Psychoticism syndromes. In addition to failing to contribute significantly to prediction, the syndrome scores varied from positive to negative on different tests. For Digit Span, although

Disorganization scores were negatively associated with scores, Negative and Psychoticism scores were slightly positively associated with Digit Span scores (see Table 7). This indicates that higher levels of Negative and Psychoticism scores are slightly associated with better Digit Span performance.

Although the participants failed to improve their performance to a normal level on the Digit Span and Trail Making (Part B) tests (see Table 4), they did perform at a normal level on post-coaching Logical Memory. The interpretation of these findings is obscured by the compilation of data into one sample, regardless of disorganization scores. A comparison of high and low disorganization participants reveals that low disorganization participants improved more from pre- to post-coaching than high disorganization on all tests except for Trail Making Test (Part A). These results further support the hypothesis that highly disorganized participants are less able to improve with coaching. One possible explanation for the better improvement exhibited by high disorganized participants on Tail Making Test (Part A), other than random variation, is the possibility that low disorganized participants were performing at a near optimal level of performance without coaching. Therefore, coaching would provide less improvement due to the lack of room for it. These results are apparent in the multiple regression analyses performed on improvement scores, which yielded negative beta values indicating that higher disorganization scores are associated with lower levels of improvement.

Of interest is the correlation found between Disorganization and Negative syndrome scores ($r = .40$, $p = .003$) which is similar to that of Andreasen et al. (1995). Although Andreasen et al. (1995) did not report correlation coefficients

for syndrome scores among themselves, they did report correlations between individual global SANS/SAPS item ratings. The correlations reported revealed that bizarre behavior, an item belonging to Disorganization syndrome, was highly correlated with both avolition (r = .41) and anhedonia (r = .40), both items belonging to Negative syndrome. When four factors are extracted rather than three, bizarre behavior constitutes a factor itself (Andreasen & Olsen, 1982; Peralta et al., 1982), but when a three factor solution is obtained, bizarre behavior loads on disorganization syndrome. The results of the Pearson correlations performed in this study on global items revealed a similar trend (see Table 3). Bizarre behavior was found to be significantly correlated with avolition, alogia, affective blunting, and anhedonia. Neither of the other two global items (inappropriate affect, thought disorder) that contributed to Disorganization scores were correlated with a single Negative symptom item. Therefore, it is apparent that the high correlation between Disorganization and Negative syndrome scores is due to bizarre behavior scores. In regard to these findings, future research may consider omitting bizarre behavior from Disorganization syndrome scores due to its apparent heterogeneous nature.

Although participants did not improve performance on post-coaching test scores to the level of normal performance on all items, they did perform at a normal level on Logical Memory. When the sample was divided into high and low disorganization scores (using a median split procedure), the low disorganization group clearly performed at a normal level on Logical Memory and Digit Span. It is also apparent that post-coaching scores for the low disorganization group are

higher than those of the high disorganization group. Coaching was clearly more effective for low disorganization participants compared to high disorganization participants (see Table 5). These findings support findings by Green et al. (1990) that schizophrenics can be classified as learners and non-learners.

The results of the multiple regression analyses performed on improvement scores also supported our hypothesis that Disorganization syndrome scores would be associated with lack of significant improvement after coaching, and Psychoticism scores would be positively associated with improvement. Results indicate that Disorganization was the only syndrome score to significantly predict performance on tests except for Logical Memory, where Psychoticism also accounted for a significant amount of variance. None of the syndrome scores were predictive of performance on Digit Vigilance. The direction of the beta values is of importance when interpreting these findings. Although non-significant (except for Logical Memory), Psychoticism scores were always positively associated with improvement on the measures (see Tables 6-10, Panel 3), suggesting that as Psychoticism scores increased, improvement scores also increased.

The opposite was found for Disorganization syndrome scores. Negative beta values were found for Disorganization syndrome on all measures except for the Trail Making Test (Part A). The negative beta values indicate that as Disorganization scores increased, improvement scores actually decreased. That is, performance actually got worse from pre- to post-coaching. One possible explanation for the negative relationship is that the patients' concentration was so

poor by the end of the interview and pre-coaching that either the coaching was not attended to or they simple were not concentrating on the post-coaching tests.

Although previous studies have reported a negative correlation between psychomotor poverty (negative) syndrome and dose of antipsychotic medications (r = -.26) (Liddle & Barnes, 1990) and a positive correlation between reality distortion (psychoticism) and dose of neuroleptic drugs (r = .31) (Liddle, 1987a), the results of Pearson correlations performed on the data from the current study found no significant relationships between any syndrome and dosage of medications. These inconsistencies are not surprising considering the disparate results reported by Liddle and Barnes (1990) and Liddle (1987a). Furthermore, although Liddle (1987b) reported a positive correlation between educational achievement and reality distortion (psychoticism) (r = .24), the current investigation found no such relationship.

With regard to gender differences, performance exhibited by females was superior to males' performance. Although no gender differences were found on any of the syndrome scores, females outperformed males on pre-coaching Digit Span and Logical Memory, and on post-coaching Logical Memory and Trail Making (Part A). The possible differences that may exist between gender groups needs to be further investigated. In the future, gender differences may need to be considered during the analyses.

In regard to the high inter-rater correlation coefficients, it should be noted that careful, detailed training took place prior to the start of the study. The two experimenters who collected data spent many hours studying the SANS/SAPS

scoring guide. They predicted together, and by the start of the study were extremely consistent in their assigning of numerical values to responses and behaviors.

Throughout the collection and analysis of this data, the author noticed two areas that warrant discussion: converting psychotropic drugs into Thorazine equivalents and assessing pre-morbid assessments via patient interviews. First, the tradition of converting patients' daily dosages of medications into equivalents of Thorazine. In 1976, Davis published a table that provides ratios for converting psychotropic medications into Thorazine equivalents. The problem, however, is that new (e.g., Clozaril and Risperdol) drugs have come into use since 1976. Although studies still include Thorazine equivalencies reports of medication levels, they are not addressing the conversion of such drugs. Furthermore, through a conversation with Del Miller, PharmD, who works in Nancy Andreasen's lab, it became apparent that the problem goes even deeper. Even among the drugs that can be converted, there is a problem of what systems they target. While some target Dopamine D^1 receptors, others target D^2 receptors. Furthermore, the interacting effects of several drugs taken at one time is still not clear. Then there are the drugs not classified as psychotropic (e.g. Lithium Carbonate). The effects of these drugs are not even considered in the conversion table. In short, a suggestion for future studies using psychotic populations would be to include information on how many patients are receiving other non-convertible psychotropic medications (e.g., Clozaril and Risperdol).

With regard to the interview measure of premorbid adjustment, it appeared that a large percentage of the sample was fantasizing or exaggerating during the assessment. Many had claimed to be professional athletes, celebrities, and graduates of Ivy league schools. For this reason, it appears that premorbid assessments can only be accurately obtained by interviewing family members. Although this may be inconvenient, it is the only way to assure that the responses are accurate and truthful.

In the future, investigators may wish to alter the coaching procedures developed for this study. For Logical Memory, it would be a better measure of true "improvement" if a novel story were administered during the post-coaching phase. Administering the same measure two times is measuring one's ability to "learn" the story with repeated exposure and studying rather than learning how to attend and process a novel story. For Digit Span, the method employed in this study could have been more effective if the participants were given additional instructions concerning "chunking" techniques and mnemonic devices. Digit Vigilance is a test that is really difficult to coach. The test is merely measuring one's ability to sustain attention, and it is improbable that testing techniques will improve attention in this population. The training techniques used for Trail Making A and B appeared to be very effective. The "counting out loud" technique appeared to help keep the participants aware of where they were and what was next, especially on Trail Making B. Lack of improvement on this test further supports the cognitive deficits in this population.

One suggestion for increasing improvement on the tests could be to introduce adequate performance-based (incentive) reward. Although participants received a soda for participation, the reward was not contingent on performance or even completion of the study for that matter. Bellack et al. (1990) found that incentive coupled with training was required to bring performance of patients to normal levels. Furthermore, the patients maintained their improvement on a subsequent day. In light of these findings and those of the current study, future research should introduce a performance-based incentive system along with training. Decrements in post-coaching performance will then be a better index of neuropsychological deficits, rather than motivational deficits.

Conclusions

The current study found that Disorganization syndrome was the best predictor of poor performance on a battery of neuropsychological tests. The syndrome not only predicted pre-coaching performance, but also improvement after coaching. A comparison of low and high Disorganized patients revealed that performance on post-coaching tests was lower for participants classified as low Disorganization. These findings suggest that Disorganization syndrome represents underlying neuropsychological impairment and may have implications for prognoses. More specifically, patients who are highly Disorganized will respond less well to treatment, both pharmacologic and psychotherapeutic.

The differential contributions of each syndrome score to cognitive performance and improvement with coaching support the heterogeneity of underlying cognitive deficits in schizophrenics. These results provide evidence that

the disorganization syndrome is associated with poor concentration (Digit Vigilance) and poor performance on tests of immediate recall (Digit Span, Logical Memory) (Liddle, 1987b; Liddle et al., 1989). Unfortunately, the current investigation did not employ tests that measure figure-ground perception, which have been reported to be associated with reality distortion (psychoticism) (Liddle, 1987b); also, it did not employ tests that measure long-term memory or object naming, which have been reported to be associated with psychomotor poverty (negative) (Liddle, 1987b). Therefore, the results of this study are unable to lend support for specific deficits associated with negative and psychoticism syndromes, but they do provide support for the lack of impairment on tests of concentration and immediate recall for these syndromes. In summary, these findings suggest that schizophrenic syndromes are associated with differential patterns of neuropsychological deficits, and further provide evidence in support of the heterogeneity of schizophrenic syndromes and corresponding neuropsychological patterns.

References

Andreasen, N. C. (1982). Negative symptoms in schizophrenia: Definition and reliability. Archives of General Psychiatry, 39, 784-788.

Andreasen, N. C. (1984a). Scale for the Assessment of Negative Symptoms (SANS). Unpublished manuscript, The University of Iowa, Department of Psychiatry, College of Medicine, Iowa City.

Andreasen, N. C. (1984b). Scale for the Assessment of Positive Symptoms (SAPS). Unpublished manuscript, The University of Iowa, Department of Psychiatry, College of Medicine, Iowa City.

Andreasen, N. C. (1985). Positive vs. Negative schizophrenia: A critical evaluation. Schizophrenia Bulletin, 11, 380-389.

Andreasen, N. C., Arndt, S., Alliger, R., Miller, D., & Flaum, M. (1995). Symptoms of schizophrenia: Methods, meanings, and mechanisms. Archives of General Psychiatry, 52, 341-351.

Andreasen, N. C., Flaum, M., & Swayze, V. W. (1990). Positive and negative symptoms in schizophrenia. Archives of General Psychiatry, 47, 615-621.

Andreasen, N. C. & Olsen, S. (1982). Negative v positive schizophrenia: Definition and validation. Archives of General Psychiatry, 39, 789-794.

Arndt, S., Alliger, R. J., & Andreasen, N. C. (1991). The distinction of positive and negative symptoms: The failure of a two-dimensional model. British Journal of Psychiatry, 158, 317-322.

Bellack, A. S., Mueser, K. T., Morrison, R. L., Tierney, A., & Podell, K. (1990). Remediation of cognitive deficits in schizophrenia. American Journal of Psychiatry, 147, 1650-1655.

Berman, K. F., Zec, R. F., & Weinberger, D. R. (1986). Physiologic dysfunction of dorsolateral prefrontal cortex in schizophrenia: II. Role of neuroleptic treatment, attention, and mental effort. Archives of General Psychiatry, 43, 126-135.

Cannon-Spoor, H. E., Potkins, S. G., & Wyatt, R. J. (1982). Measurement of premorbid adjustment in chronic schizophrenia. Schizophrenia Bulletin, 8, 470-484.

Carpenter, W. J., Heinrichs, D. G., & Wagman, A. M. I. (1988). Deficit and nondeficit forms of schizophrenia: The concept. American Journal of Psychiatry, 145, 578-583.

Crow, T. J. (1980). Molecular pathology of schizophrenia: more than one disease process? British Medical Journal, 280, 66-68.

Crow, T. J. (1985). The two-syndrome concept: Origins and current status. Schizophrenia Bulletin, 11, 471-486.

Davis, J. M. (1976). Comparative doses and costs of antipsychotic medication. Archives of General Psychiatry, 33, 858-861.

Goldberg, T. E., Weinberger, D. R., Berman, K. F., Pliskin, N. H., & Podd, M. H. (1987). Further evidence for dementia of the prefrontal type in schizophrenia? A controlled study of teaching the wisconsin card sorting test. Archives of General Psychiatry, 44, 1008-1014.

Green, M. F., Ganzell, S., Satz, P., & Vaclav, J. F. (1990). Teaching the Wisconsin card sorting test to schizophrenic patients. Archives of General Psychiatry, 47, 91-92.

Gorsuch, R. L. (1974). Factor Analysis. Philadelphia: WB Saunders Co.

Lewine, R. R. J., Fogg, L., & Meltzer, H. Y. (1983). Assessment of negative and positive symptoms in schizophrenia. Schizophrenia Bulletin, 9, 368-376.

Liddle, P. F. (1987a). The symptoms of chronic schizophrenia: A re-examination of the positive-negative dichotomy. British Journal of Psychiatry, 151, 145-151.

Liddle, P. F. (1987b). Schizophrenic syndromes, cognitive performance and neurological dysfunction. Psychological Medicine, 17, 49-57.

Liddle, P. F. & Barnes, T. R. E. (1990). Syndromes of chronic schizophrenia. British Journal of Psychiatry, 157, 558-561.

Liddle, P. F., Barnes, T. R. E., Morris, D., & Haque, S. (1989). Three syndromes in chronic schizophrenia. British Journal of Psychiatry, 155, 119-122.

Liddle, P. F., Friston, K. J., Frith, C. D., Hirsch, S. R., Jones, T., & Frackowiak, R. S. J. (1992). Patterns of cerebral blood flow in schizophrenia. British Journal of Psychiatry, 160, 179-186.

Liddle, P. F. & Morris, D. L. (1991). Schizophrenic syndromes and frontal lobe performance. British Journal of Psychiatry, 158, 340-345.

Malla, A. K., Norman, R. M. G., Williamson, P., Cortese, L., & Diaz, F. (1993). Three syndrome concept of schizophrenia: A factor analytic study. Schizophrenia Research, 10, 143-150.

Milner, B. & Petrides, M. (1984). Behavioral effects of frontal-lobe lesions in man. TINS, 7, 403-407.

Mirsky, A. F., Anthony, B. J., Duncan, C. C., Ahearn, M. B., & Kellam, S. G. (1991). Analysis of elements of attention: A neuropsychological approach. Neuropsychology Review, 2, 109-145.

Mirsky, A. F., Yardley, S. L., Jones, B. P., Walsh. D., & Kendler, K. S. (1995). Analysis of the attention in schizophrenia: A study of patients and their relatives in Ireland. Journal of Psychiatric Research, 29, 23-42.

Peralta, V., de Leon, J., & Cuesta, M. J. (1992). Are there more than two syndromes in schizophrenia? A critique of the positive-negative dichotomy. British Journal of Psychiatry, 161, 335-343.

Ragland, J. D., Gur, R. C., Deutsch, G. K., Censits, D. M., & Gur, R. E. (1995). Reliability and construct validity of the paired-associative recognition test: A test of declarative memory using wisconsin card sorting stimuli. Psychological Assessment, 7, 25-32.

Rosenthal, R., & Rosnow, R. L. (1991). Essentials of behavioral research: Methods and data analysis (2nd ed.). McGraw-Hill.

Rosvold, H. E., Mirsky, A. F., Sarason, I., Bransome, E. D., & Beck, L. H. (1956). A continuous performance test of brain damage. Journal of Consulting Psychology, 20, 343-350.

Shean, G. D. & Rowe, E. W. (1995). Card sort performance and syndromes of schizophrenia. Paper presented at Southeastern Psychological Association meeting, Norfolk, Virginia.

Stroop, J. R. (1935). Studies of interference in serial verbal reactions. Journal of Experimental Psychology, 18, 643-662.

Summerfelt, A. T., Alphs, L. D., Funderburk, F. R., Strauss, M. E., & Wagman, A. M. I. (1991). Impaired Wisconsin card sort performance in schizophrenia may reflect motivational deficits. Archives of General Psychiatry, 48, 282-283.

Talland, G. A. (1965). Deranged memory. New York: Academic Press.

Van der Does, A. J. W., Dingemans, P. M. A. J., Linszen, D. H., Nugter, M. A., & Scholte, W. F. (1993). Symptom dimensions and cognitive and social function in recent-onset schizophrenia. Psychological Medicine, 23, 745-753.

Wechsler, D. (1981). Wechsler Adult Intelligent Scale - Revised. Psychological Corporation, New York.

Weinberger, D. R., Berman, K. F., & Zec, R. F. (1986). Physiologic dysfunction of dorsolateral prefrontal cortex in schizophrenia: I. Regional cerebral blood flow evidence. Archives of General Psychiatry, 43, 114-124.

Table 1

Demographic Information (N = 51)

	Minimum	Maximum	Mean
Age	19	59	40.9
Education (years)	6	16	11.13
Number of Hospitalizations	1	23	6.16
Meds (mg/day Thorazine) *	100	2000	660.60

* Thorazine dosage equivalents were determined from participants (N = 30) who were taking medications included in Davis'(1976) conversion table.

Table 2

Gender differences of dependent measure scores

Panel 1 **(Pre-coaching)**

	Females	Males	T-Value	Sig. Of T
Logical Memory	8.76	6.25	2.28	.027
Digit Span	12.15	9.4	3.33	.002
Digit Vigilance	33.61	30.74	.82	ns
Trial Making A	55.52	77.18	-1.87	.07
Trail Making B	144.22	177.40	-1.67	ns

Panel 2 **(Post-coaching)**

	Females	Males	T-Value	Sig. Of T
Logical Memory	13.3	9.9	2.24	.03
Digit Span	12.84	10.9	1.6	ns
Digit Vigilance	39.9	33.3	1.61	ns
Trial Making A	38.26	65.5	-2.73	.009
Trail Making B	115.1	147.9	-1.79	ns

Table 2 (Continued)

Panel 3 **(Improvement)**

	Females	Males	T-Value	Sig. Of T
Logical Memory	4.6	3.7	.84	ns
Digit Span	.68	1.51	-.84	ns
Digit Vigilance	6.3	2.9	1.7	ns
Trial Making A	17.2	11.68	1.08	ns
Trail Making B	33.55	29.43	.34	ns

Table 3

Pearson Correlations among SANS/SAPS global ratings

Symptom	Avolition	Anhedonia	Affective Blunting	Alogia	Inapprop. Affect	Thought Disorder	Bizarre Behavior
Avolition	1.00						
Anhedonia	.49 **	1.00					
Blunting	.51 **	.34 *	1.00				
Alogia	.61 **	.46 **	.65 **	1.00			
Inapp. Affect	-.17	.49	-.04	-.14	1.00		
Tht. Disorder	.25	.25	.06	.27	.36	1.00	
Behavior	**.53 ** **	**.57 ** **	**.32 ***	**.33 ***	**.56**	**.47 ** **	**1.00**

* $p < .05$ ** $p < .01$

Table 4

Means (Standard Deviations) of dependent measures at pre- and post-coaching and improvement.

	Pre-Coaching	Post-Coaching	Improvement	Norm
Logical Memory	7.19 (3.96)	11.23 (5.39)	4.04 (3.51)	13
Digit Span	10.43 (3.13)	11.64 (4.22)	1.20 (3.40)	15
Digit Vigilance	31.80 (11.76)	35.81 (13.98)	4.19 (6.65)	N/A
Trail Making A	69.12 (41.04)	55.35 (36.65)	13.76 (17.86)	25-27
Trail Making B	165.46 (68.71)	135.73 (64.88)	30.92 (41.27)	61-72

Table 5

Means (standard deviation) of dependent measures for high and low Disorganization scores.

Panel 1 (High Disorganization)

	Pre-Coaching	Post-Coaching	Improvement	Norm
Logical Memory	5.23 (4.01)	7.5 (4.62)	2.26 (3.25)	13
Digit Span	9.43 (3.69)	9.22 (3.42)	-.18 (1.65)	15
Digit Vigilance	25.55 (11.18)	28.27 (14.43)	2.72 (5.75)	N/A
Trail Making A	90.3 (51.8)	73.08 (45.5)	17.21 (22.81)	25-27
Trail Making B	205.09 (77.9)	180.82 (70.72)	24.90 (52.25)	61-72

Panel 2 (Low Disorganization)

	Pre-Coaching	Post-Coaching	Improvement	Norm
Logical Memory	8.79 (3.18)	14.29 (3.86)	5.5 (3.05)	13
Digit Span	11.25 (2.33)	13.53 (3.83)	2.29 (4.01)	15
Digit Vigilance	36.89 (9.72)	42.19 (10.01)	5.42 (7.20)	N/A
Trails A	51.71 (15.32)	40.78 (17.65)	10.9 (12.17)	25-27
Trails B	134.32 (39.5)	98.67 (23.75)	35.64 (30.24)	61-72

Table 6

Logical Memory

Panel 1 **(Pre-Coaching)**

Multiple R = .53, R^2 = .28, F(3,47) = 6.35, p = .001

	Beta	sr	T-Value	Sig. of T.
Disorganization	**-.55**	**-.503**	**-4.09**	**.0002**
Negative	.14	.12	1.01	ns
Psychoticism	-.09	-.08	-.71	ns

Panel 2 **(Post-Coaching)**

Multiple R = .65, R^2 = .42, F(3,47) = 11.43, p = .0000

	Beta	sr	T-Value	Sig. of T.
Disorganization	**-.62**	**-.56**	**-5.06**	**.0000**
Negative	-.04	-.04	-.39	ns
Psychoticism	.12	.12	1.10	ns

Panel 3 **(Improvement)**

Multiple R = .56, R^2 = .32, F(3,47) = 7.53, p = .0003

	Beta	sr	T-Value	Sig. of T.
Disorganization	**-.32**	**-.29**	**-2.44**	**.01**
Negative	-.23	-.20	-1.72	.09
Psychoticism	**.29**	**.28**	**2.39**	**.02**

Table 7

Digit Span

Panel 1 **(Pre-Coaching)**

Multiple R = .38, R^2 = .14, F(3,47) = 2.56, p = .06

	Beta	sr	T-Value	Sig. of T.
Disorganization	**-.41**	**-.37**	**-2.74**	**.009**
Negative	.12	.11	.81	ns
Psychoticism	.07	.07	.56	ns

Panel 2 **(Post-Coaching)**

Multiple R = .51, R^2 = .27, F(3,46) = 5.67, p = .002

	Beta	sr	T-Value	Sig. of T.
Disorganization	**-.54**	**-.49**	**-3.9**	**.0003**
Negative	.10	.09	.75	ns
Psychoticism	.13	.12	1.01	ns

Panel 3 **(Improvement)**

Multiple R = .29, R^2 = .09, F(3,46) = 1.51, p = ns

	Beta	sr	T-Value	Sig. of T.
Disorganization	**-.28**	**-.26**	**-1.83**	**.07**
Negative	.01	.01	.08	ns
Psychoticism	.10	.10	.75	ns

Table 8

Digit Vigilance

Panel 1 **(Pre-Coaching)**

Multiple R = .54, R^2 = .29, F(3,45) = 6.35, p = .001

	Beta	sr	T-Value	Sig. of T.
Disorganization	**-.48**	**-.44**	**-3.52**	**.001**
Negative	-.11	-.09	-.79	ns
Psychoticism	.04	.04	.34	ns

Panel 2 **(Post-Coaching)**

Multiple R = .53, R^2 = .28, F(3,44) = 5.6, p = .002

	Beta	sr	T-Value	Sig. of T.
Disorganization	**-.51**	**-.46**	**-3.56**	**.0009**
Negative	-.04	-.03	-.26	ns
Psychoticism	.09	.08	.66	ns

Panel 3 **(Improvement)**

Multiple R = .20, R^2 = .04, F(3,44) = .61, p = ns

	Beta	sr	T-Value	Sig. of T.
Disorganization	-.19	-.18	-1.2	ns
Negative	.11	.10	.69	ns
Psychoticism	.11	.11	.75	ns

Table 9

Trail Making Test (Part A)

Panel 1 **(Pre-Coaching)**

Multiple R = .66, R^2 = .43, F(3,47) = 12.15, p = .0000

	Beta	sr	T-Value	Sig. of T.
Disorganization	**.65**	**.59**	**5.41**	**.0000**
Negative	.00	.00	.01	ns
Psychoticism	.03	.03	.28	ns

Panel 2 **(Post-Coaching)**

Multiple R = .61, R^2 = .38, F(3,47) = 9.45, p = .0001

	Beta	sr	T-Value	Sig. of T.
Disorganization	**.61**	**.55**	**4.8**	**.0000**
Negative	.00	.00	.02	ns
Psychoticism	-.05	-.05	-.45	ns

Panel 3 **(Improvement)**

Multiple R = .32, R^2 = .10, F(3,47) = 1.78, p = .16

	Beta	sr	T-Value	Sig. of T.
Disorganization	**.25**	**.22**	**1.64**	**.10**
Negative	-.00	-.00	-.01	ns
Psychoticism	.18	.17	1.27	ns

Table 10

Trail Making Test (Part B)

Panel 1 **(Pre-Coaching)**

Multiple R = .42, R^2 = .17, F(3,46) = 3.32, p = .02

	Beta	sr	T-Value	Sig. of T.
Disorganization	**.44**	**.39**	**2.99**	**.004**
Negative	-.05	-.05	-.40	ns
Psychoticism	-.06	-.06	-.44	ns

Panel 2 **(Post-Coaching)**

Multiple R = .63, R^2 = .40, F(3,47) = 10.47, p = .0000

	Beta	sr	T-Value	Sig. of T.
Disorganization	**.65**	**.59**	**5.19**	**.0000**
Negative	-.04	-.03	-.29	ns
Psychoticism	-.06	-.05	-.47	ns

Panel 3 **(Improvement)**

Multiple R = .29, R^2 = .08, F(3,46) = 1.42, p = ns

	Beta	sr	T-Value	Sig. of T.
Disorganization	**-.27**	**-.24**	**-1.71**	**.09**
Negative	-.05	-.04	-.28	ns
Psychoticism	-.01	-.01	-.09	ns

Appendix A

Demographic Information Form

Schizophrenia Research Study Eastern State Hospital

Name:_____ Date of Testing:_____

ID Number: _____ Number of Admissions:_____

Age: _____ Date of Birth: _____

Diagnosis:

Axis I schizophrenia _____

schizoaffective_____

schizotypal _____

other _____

Axis II _____

_____

_____

Axis III _____

Medications:_____

_____

Recent Medication changes ? _____

PRN? _____

AMES (tardive dyskenesia) score:_____

Appendix B

Research Participation Consent Form

I, _____, hereby agree to participate in the research project titles "Neuropsychological Correlates of Three Syndromes", conducted by Dr. Glenn Shean, Scott Eckman, and Rebecca Plesko. I understand that all information obtained by or about me will be held in strict confidence and no information will be given that will identify me. I also understand that how I do in the interview will not affect my treatment nor my stay in this facility or after release.

I understand that during the study I will be asked to participate in a brief interview which will take approximately 10 minutes. During the interview I will be asked questions about my current experiences and the problems that led to this hospitalization. Second, I will be asked to complete several measures of my ability to attend to tasks and of my memory functions. I also understand that participation in the study will involve no potential risks, discomforts or inconveniences to me as a participant and there is no cost to this study other than about 1 hour of my time.

I understand that I will be assigned a number which will be used to record my answers to the interview questions in order to protect my confidentiality.

I understand that my participation in this research project is entirely voluntary. I may withdraw at any time during the session and, if I have any questions, I may ask them at any time during the study. There will be no consequences for stopping at any time and I may refuse to answer any question at any time.

I agree to give Dr. Shean, Ms. Plesko, and Mr. Eckman permission to obtain the following information from my records: age at first hospitalization, number of hospitalizations, diagnosis, education and current medication.

I, _____, agree to participate in the study with full knowledge of the information presented above. I understand that I may withdraw at any time and that any questions that I have will be answered by Dr. Shean, Ms. Plesko, or Mr. Eckman. I authorize Dr. Glenn Shean and/or designated research associates to release the results of testing to my clinical treatment team here at Eastern State Hospital.

I understand, if I have any questions or problems about these procedures, I can direct them to Mr. James Parham, Director of Staff Development, Training, & Research (804) 253-5058. Dr. Shean and Ms. Plesko will also be available to answer any questions (804) 221-3886.

_____ _____

Research Subject Research Assistant

_____

Date

Appendix C

Subject ID# _____ Total of all Ratings _____
Interview Guidelines for Rating of Pre-Diagnosis Social Competence

"I would like you to try to think back to when you were about 10-14 years old and what your life was like when you answer these questions".

Ratings *: 0 = none 1 = one or two/frequent 2 = several 3 = very active
*consider plausibility

1. What sort of sports, teams, or activities were you involved in? About how many times a week?
List:
Rating_____

2.What sort of hobbies did you enjoy & how often?
List:
Rating_____

3. What were the name(s) of your best friend(s)? How often did you see him/her/them? What things did you enjoy doing together?
List:
Rating_____

4.Did you enjoy being with lots of people, like at parties, school dances? Or did you prefer quiet times?
List:
Rating_____

5.How old were you when you first started dating someone seriously?
Age___ How often did you date?
Rating_____

6.What jobs did you have as a young teenager? For example, paper route, babysitting....
List:
Rating_____
7. How far did you go in school? _____grade.
8.What grades did you make on average in your math classes?___, English classes? ___. How many times did you make the honor roll? _____
Rating _____
9.Were you ever in special classes? For some subjects? Describe_____

Appendix D

SAPS/SANS

0 = NONE, 1 = QUESTIONABLE, 2 = MILD, 3 = MODERATE, 4 = MARKED, 5 = SEVERE

POSITIVE SYMPTOMS

1. HALLUCINATIONS

A. VOICES _____
SOMETIMES PEOPLE HEAR SOUNDS OR VOICES WHEN NO ONE IS AROUND. HAVE YOU EVER HAD THIS EXPERIENCE?
IF THE ANSWER IS AFFIRMATIVE, WHAT DID THEY SAY?

B. VOICES COMMENTING _____
HAVE YOU EVER HEARD VOICES COMMENTING ON WHAT YOU WERE THINKING OR DOING? TELL ME ABOUT THESE VOICES. WHAT DO THEY SAY?

C. VOICES CONVERSING _____
HAVE YOU EVER HEARD TWO OR MORE VOICES TALKING WITH EACH OTHER?
WHAT DID THEY DAY?

D. SOMATIC OF TACTILE HALLUCINATIONS _____
HAVE YOU EVER HAD STRANGE FEELINGS IN YOUR BODY, LIKE BURNING SENSATIONS? WHAT WERE THEY?

CHANGES IN THE SHAPE OR SIZE OF PARTS OF YOUR BODY?
WHAT WERE THEY?

E. OLFACTORY HALLUCINATIONS _____
HAVE YOU EVER EXPERIENCED ANY UNUSUAL SMELLS OR SMELL THAT OTHERS DO/DID NOT SEEM TO NOTICE?
WHAT WERE THEY?

F. VISUAL HALLUCINATIONS _____
HAVE YOUR EVER SEEN THINGS THAT OTHER PEOPLE DID NOT SEE?
WHAT WERE THEY?

DID THIS OCCUR WHEN YOU WERE FALLING ASLEEP OR WAKING UP?

Appendix D (Continued)

1. GLOBAL RATING HALLUCINATIONS (0 = NONE, 5 = SEVERE) _____

2. DELUSIONS

A. PERSECUTION _____
HAVE YOU EVER HAD TROUBLE GETTING ALONG WITH PEOPLE?

HAVE YOU EVER FELT THAT PEOPLE WERE AGAINST YOU?

HAVE YOU EVER FELT THAT SOMEONE HAS BEEN TRYING TO HARM YOU?

HAVE YOU EVER THOUGHT THAT PEOPLE WERE PLOTTING AGAINST YOU?

B. JEALOUSY _____
HAVE YOU EVER FELT THAT SOMEONE YOU LOVED WAS UNFAITHFUL TO YOU?

WHAT MADE YOU THINK THAT?

C. SIN OR GUILT _____
HAVE YOU EVER FELT THAT YOU HAD DONE SOMETHING VERY WRONG THAT YOU DESERVED TO BE PUNISHED FOR?
IF THE ANSWER IS YES HAVE S ELABORATE.

D. GRANDIOSE _____
HAVE YOU EVER FELT THAT YOU MAY HAVE SPECIAL POWERS OR ABILITIES?

HAVE YOU EVER FELT THAT YOU ARE DESTINED TO DO IMPORTANT THINGS?

E.RELIGIOUS _____
HAVE YOU HAD UNUSUAL RELIGIOUS EXPERIENCES?

F. SOMATIC _____
HAVE YOU EVER FEL THAT SOMETHING STRANGE WAS HAPPENING TO YOUR BODY?

HAVE YOU NOTICED ANY UNUSUAL CHANGES IN YOUR APPEARANCE?

Appendix D (Continued)

G. REFERENCE _____
HAVE YOU EVER WALKED INTO A ROOM AND THOUGHT PEOPLE WERE TALKING ABOUT YOU OR LAUGHING AT YOU? ASK FOR ELABORATION.

HAVE YOU EVER READ SOMETHING OR WATCHED TV AND THOUGHT THAT THEY WERE REFERRING TO YOU, OR SENDING A SPECIAL MESSAGE TO YOU?

H. CONTROL _____
HAVE YOU EVER FELT THAT SOME OUTSIDE FORCE WAS CONTROLLING YOUR THOUGHTS, ...FEELINGS, BEHAVIOR?

I. MIND READING _____
HAVE YOU EVER HAD THE FEELING THAT PEOPLE WERE READING YOUR MIND?

J. THOUGHT BROADCASTING _____
HAVE YOU EVER THOUGHT YOU HEARD YOUR OWN THOUGHTS OUT LOUD, AS IF THEY WERE A VOICE OUTSIDE YOUR OWN HEAD?

HAVE YOU EVER FELT YOUR THOUGHTS WERE BROADCAST SO OTHER PEOPLE COULD HEAR THEM?

K. THOUGHT INSERTION _____
HAVE YOU EVER HAD THE FEELING THAT THOUGHT WERE BEING PUT INTO YOUR HEAD BY SOME OUTSIDE FORCE OR PERSONS?

L. THOUGHT WITHDRAWAL _____
HAVE YOU EVER FELT YOUR THOUGHTS WERE TAKEN AWAY BY SOME OUTSIDE FORCE OR AGENCY?

GLOBAL RATING OF SEVERITY OF DELUSIONS _____

3. RATINGS OF BEHAVIOR
*THESE RATINGS CAN BE COMPLETED LARGELY BASED ON YOUR OWN OBSERVATIONS DURING THE INTERVIEW AND TEST SESSIONS.
*INDICATES THAT YOU SHOULD REQUEST STAFF INPUT BEFORE RATING.

Appendix D (Continued)

A. CLOTHING AND APPEARANCE _____
*B. SEXUAL BEHAVIOR _____ (RATE ONLY IF STAFF REPORTS FREQUENT EPISODES OF BIZARRE SEXUAL BEHAVIOR.)
*C. AGGRESSIVE-AGITATED BEHAVIOR _____
*D. REPETITIVE OR STEREOTYPED BEHAVIOR _____

GLOBAL RATING OF BEHAVIOR _____

4. FORMAL THOUGHT DISORDER

A. LOOSE ASSOCIATIONS _____
E.G., GETS OFF TRACK, SLIPS FROM ONE IDEA TO ANOTHER ONLY TANGENTIALLY RELATED, DISJOINTED, LACK OF COHESION EVEN BETWEEN SENTENCES, UNCLEAR PRONOUN REFERENCES.

B. TANGENTIALITY _____
ANSWERS QUESTIONS OBLIQUELY, ANSWERS TO QUESTIONS DON'T RELATE TO THE QUESTION.

C. INCOHERENCE _____
SPEECH IS INCOMPREHENSIVE AT TIMES, CONNECTIONS BETWEEN SENTENCES ARE CONFUSING. DIFFERS FROM UNGRAMMATICAL.

D. ILLOGICALITY _____
CONCLUSIONS DO NOT FOLLOW, REACHING FAULTY CONCLUSIONS ALTHOUGH NOT ACTUALLY DELUSIONAL.

E. CIRCUMSTANTIALITY _____
SPEECH IS INDIRECT, HARD TO SEE WHERE THEY ARE GOING, RAMBLING MONOLOGUES THAT MUST BE INTERRUPTED TO STAY ON TRACK.

F. PRESSURED SPEECH _____
PATIENT TALKS RAPIDLY, IT IS DIFFICULT TO INTERRUPT, SPEECH IS LOUD AND EMPHATIC.

G. DISTRACTABLE SPEECH _____
PATIENT STOPS TALKING IN THE MIDDLE OF A THOUGHT SEQUENCE, FOCUSES ON SOMETHING EXTRANEOUS.

H. CLANGING _____
A PATTERN OF SPEECH IN WHICH SOUNDS RATHER THAN MEANING GOVERN WORD CHOICE, ROYCE, COYSE, MERSE, TERSE, CURSE.

Appendix D (Continued)

GLOBAL RATING OF POSITIVE FORMAL THOUGHT DISORDER _____

NEGATIVE SYMPTOMS

0 = NONE, 1 = QUESTIONABLE, 2 = MILD, 3 = MODERATE, 4 = MARKED, 5 = SEVERE

RATINGS ARE LARGELY BASED ON OBSERVATIONS DURING THE INTERVIEW AND TEST SESSION AND SHOULD BE COMPLETED AS SOON AS POSSIBLE AFTER THE INTERVIEW.

1. AFFECTIVE FLATTENING OR BLUNTING

A. UNCHANGING FACIAL EXPRESSION _____
DOES NOT CAHNGE EXPRESSION, WOODEN, MECHANICAL.

B. DECREASED SPONTANEOUS MOVEMENTS _____
SITS DURING INTERVIEW WITH LITTLE OR NO SPONTANEOUS MOVEMENTS.

C. PAUCITY OF EXPRESSIVE GESTURES _____
DOES NOT USE BODY AS AN AID IN EXPRESSING IDEAS, NO HAND GESTURES.

D.POOR EYE CONTACT _____
AVOIDS LOOKING AT YOU OR USING EYES TO EXPRESS, STARES OFF WHILE TALKING TO YOU.

E. AFFECTIVE NONRESPONSIVITY _____
FAILS TO LAUGH OR SMILE WHEN PROMPTED.

F. INAPPROPRIATE AFFECT _____
AFFECT IS INAPPROPRIATE, NOT SIMPLY FLAT OR ABSENT. E.G., SILLY SMILE OR LAUGH WHEN TALKING ABOUT SOMETHING SAD.

G. LACK OF VOCAL INFLECTION _____
FAILS TO SHOW NORMAL EMPHASIS, MONOTONIC, NO CHANGE IN PITCH.

GLOBAL RATING OF AFFECTIVE BLUNTING _____

2. ALOGIA

A. POVERTY OF SPEECH _____
PATIENT'S REPLIES ARE BRIEF, CONCRETE, RESTRICTED

Appendix D (Continued)

B. POVERTY OF CONTENT _____
REPLIES ARE VAGUE, OVERCONCRETE, CONVEY LITTLE INFORMATION.

C. BLOCKING _____
TRAIN OF THOUGHT IS INTERRUPTED

D. INCREASED LATENCY OF RESPONSE _____
TRAIN OF THOUGHT IS INTERRUPTED.

GLOBAL RATING OF ALOGIA _____

3. AVOLITION-APATHY

A. GROOMING AND HYGIENE _____
CLOTHES SLOPPY, SOILED, HAIR UNKEPT, BODY ODOR.

B. IMPERSISTENCE _____
PATIENT DOES NOT PERSIST AT WARD ACTIVITIES...

C. PHYSICAL ANERGIA _____
PHYSICALLY INERT, DOES NOT INITIATE SPONTANEOUS ACTIVITY.

GLOBAL RATING OF AVOLITION-APATHY _____

4. ANHEDONIA-ASOCIALITY

A. FEW OR NO INTERESTS _____
SPORTS, HOBBIES, NEWS EVENTS, POLITICS, FAMILY?

B. SEXUAL ACTIVITY _____
PROBABLY SHOULD LEAVE BLANK.

C. INTIMACY _____
HOW OFTEN DO THEY WRITE BACK OR TALK TO WIVES, CHILDREN, FAMILY MEMBERS, DO THEY SEEM INTERESTED, INFORMED?

D. FRIENDS, PEERS _____
CAN THEY NAME ONE OR TWO CLOSE FRIENDS, AND DESCRIBE THINGS THEY ENJOY TOGETHER, OR DO THEY PREFER TO BE ALONE?

GLOBAL RATING OF ANHEDONIA-ASOCIALITY _____

Appendix D (Continued)

5. ATTENTION

A. SOCIAL INATTENTIVENESS _____
PATIENT IS UNINVOLVED, UNENGAGED "SPACY"

B. INATTENTIVENESS DURING TESTING _____

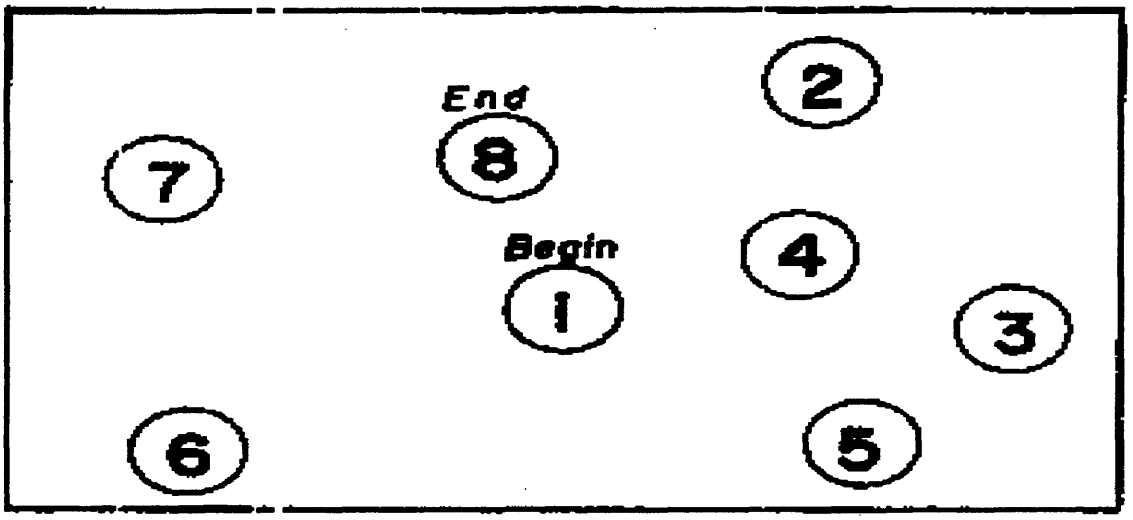
GLOBAL RATING OF ATTENTION _____

Appendix E

TRAIL MAKING

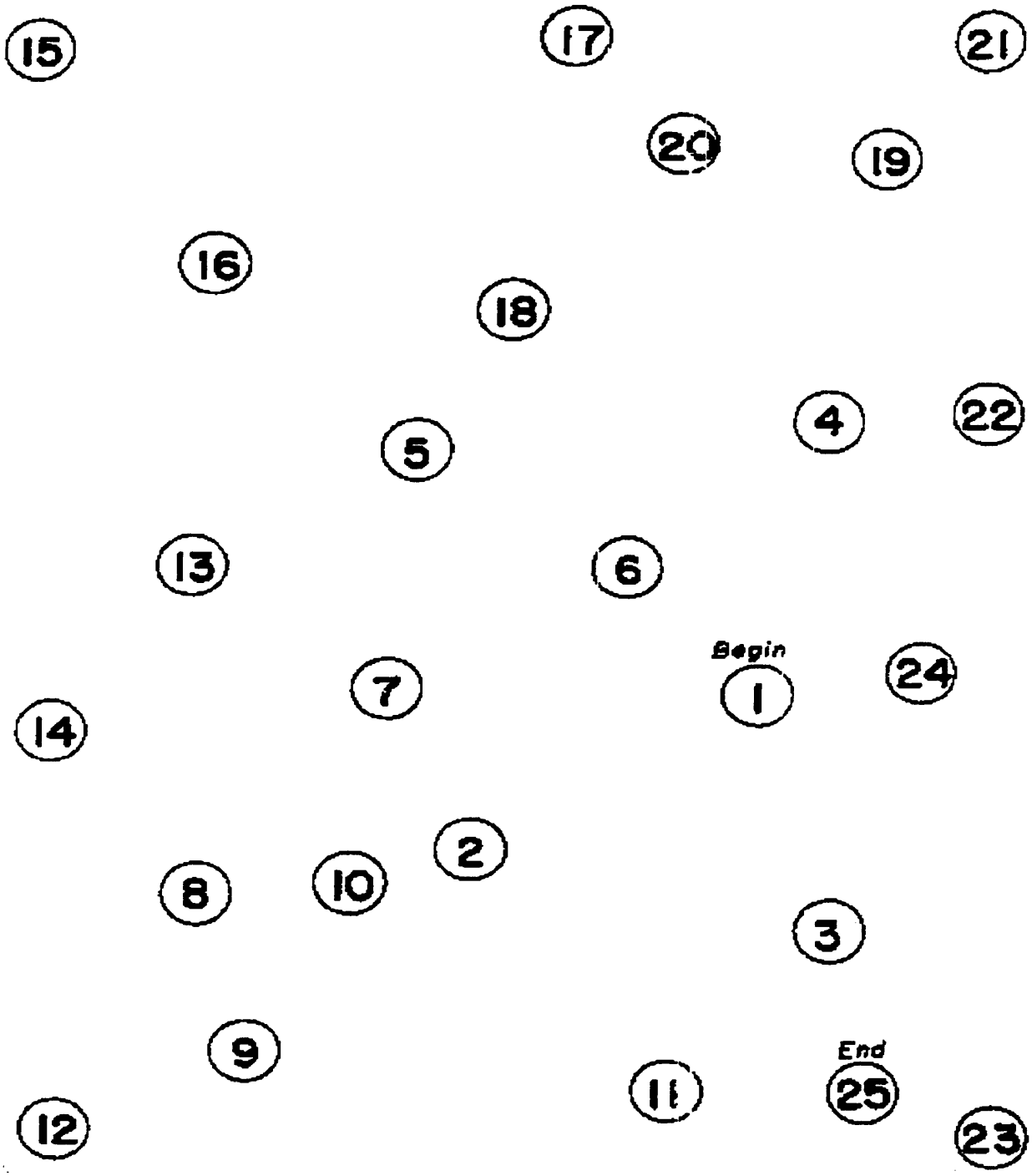
Part A

SAMPLE



Appendix E (Continued)

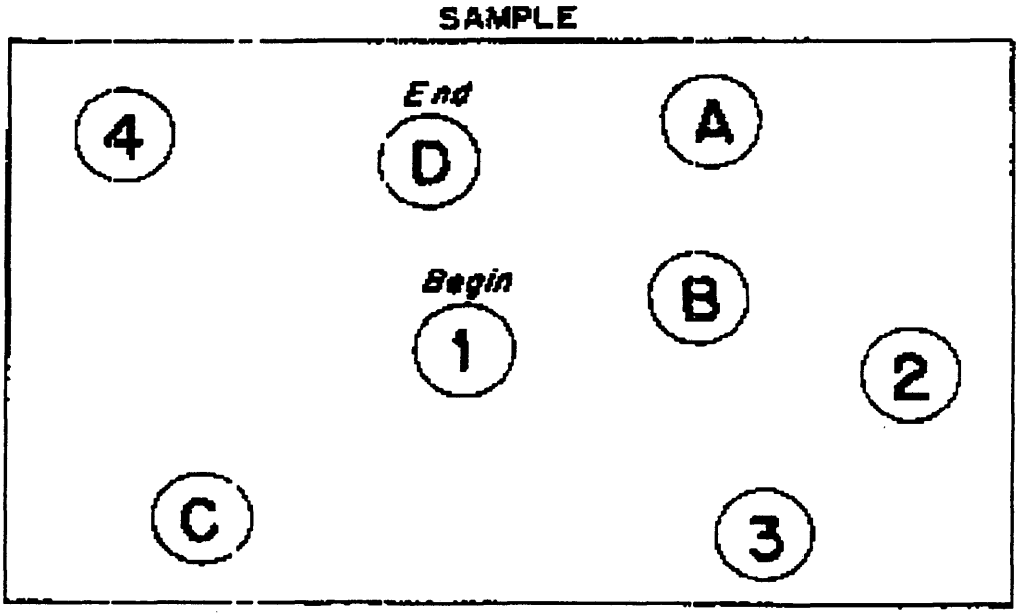
Trails A



Appendix E (Continued)

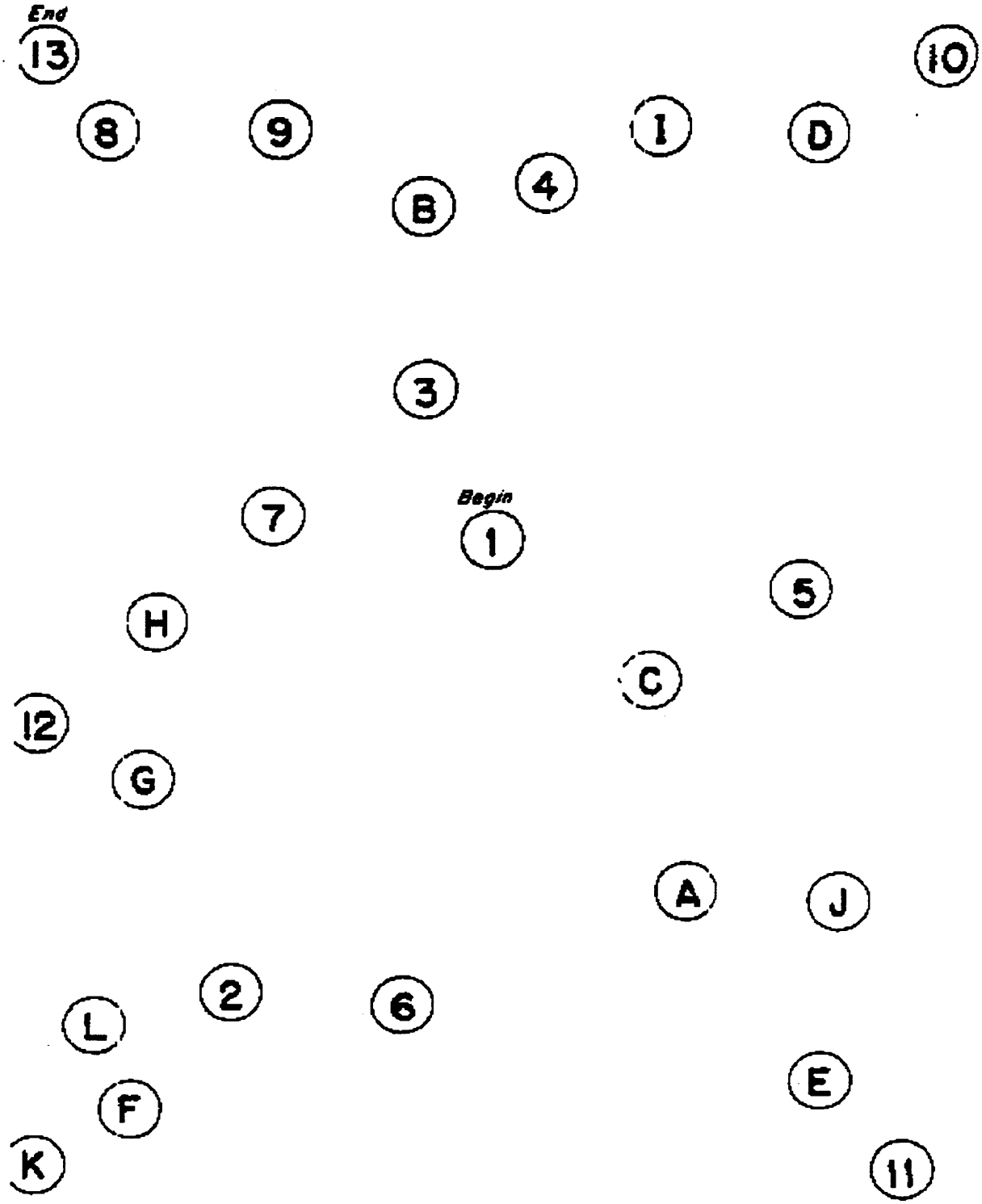
TRAIL MAKING

Part B



Appendix E (continued)

Trails B



Appendix F

Digit Span

3. DIGIT SPAN Discontinue after failure on both trials of any item.
Administer both trials of each item, even if examinee passes first trial

DIGITS FORWARD Trial 1		Response	Pass-Fail	Trial 2	Response	Pass-Fail	Score 2, 1, or 0
2.	5-8-2			6-9-4			
3.	6-4-3-9			7-2-4-8			
4.	4-2-7-3-5			7-5-8-3-6			
5.	6-1-9-4-7-3			3-9-2-4-8-7			
6.	5-9-1-7-4-2-8			6-1-7-9-3-8-6			
7.	3-8-1-4-2-6-4-7			3-8-2-9-5-1-7-4			
8.	2-7-5-3-6-2-5-8-4			7-1-3-9-6-2-5-8-4			

Administer DIGITS BACKWARD even if examinee scores 0 on DIGITS FORWARD. Max. = 14 Total Forward

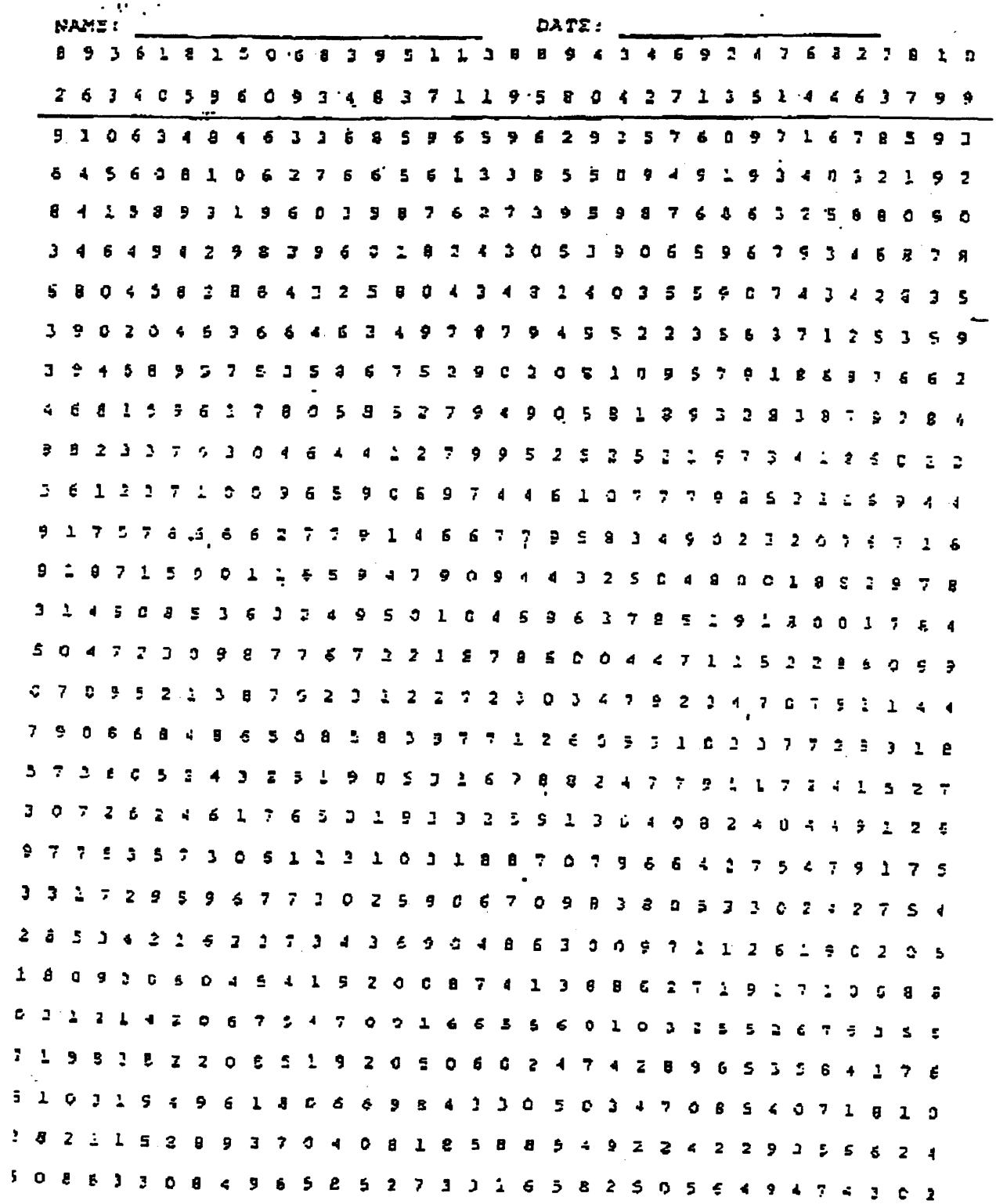
DIGITS BACKWARD Trial 1		Response	Pass-Fail	Trial 2	Response	Pass-Fail	Score 2, 1, or 0
1	2-4			3-8			
2	6-2-9			4-1-5			
3	3-2-7-4			6-2-4-8			
4	1-5-2-3-6			5-3-9-4-3			
5	5-3-9-4-1-8			7-2-4-3-5-6			
6.	8-1-2-3-6-4-5			4-7-3-9-1-2-8			
7	9-4-3-7-6-2-5-8			7-2-4-1-9-6-5-3			

Max. = 14 Total Backward

Max. Total = 28

Appendix G

Digit Vigilance



Appendix H

Logical Memory II (Story A)

Record clock time _____

LOGICAL MEMORY II Administer 30 minutes after Logical Memory I. Score 1 point for each correct item (see Appendix A in Manual for Scoring Criteria).	Score
Story A Reminder Given: ____ No ____ Yes	
Anna / Thompson / of South / Boston /, employed / as a cook /	____
in a school / cafeteria /, reported / at the City Hall / Station /	____
that she had been held up / on State Street / the night before /	____
and robbed / of fifty-six dollars /. She had four /	____
small children /, the rent was due /, and they had not eaten /	____
for two days /. The police /, touched by the woman's story /,	____
took up a collection / for her /.	____
Max = 25 Total Story A	

VITA

Preston Scott Eckman

Born in Ruston, Louisiana on October 14, 1972. He graduated from Parkview Baptist High School in May 1990. He graduated from Louisiana State University with a B.S. in Psychology in May 1995. He entered the master's program in experimental psychology at the College of William and Mary in August 1995 and graduated in May 1997.