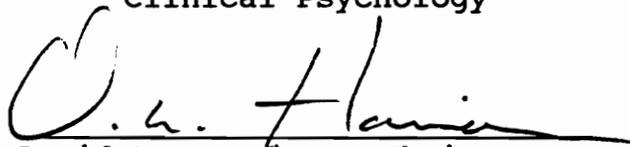


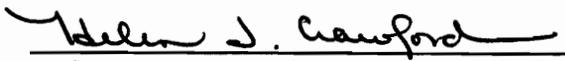
Neuropsychological Test Performances of
Young Depressed Outpatient Women:
An Examination of Executive Functions
by
William David Crews, Jr.

Dissertation

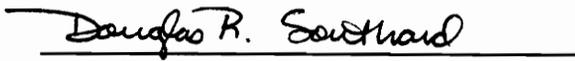
Submitted to the Faculty of the
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in partial fulfillment of the requirements for the degree of
Doctor of Philosophy
in
Clinical Psychology

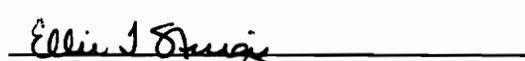
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Key words: Neuropsychology, Executive Functions,
Depression, Test Performances, Women, Outpatient

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NEUROPSYCHOLOGICAL TEST PERFORMANCES OF
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David W. Harrison, Chairman

Psychology

(ABSTRACT)

Thirty young, unmedicated, outpatient, depressed women were compared to an equal number of matching controls on a series of neuropsychological tests purported to be sensitive to the executive functions. Specifically, the measures included the Design Fluency Test, the WAIS-R Digit Span subtest, a Dynamometer task of hand grip strength, perseveration, and fatigue, the FAS Verbal Fluency Test, a Serial Sevens Test, the Stroop Color and Word Test, and the Trail Making Test, as well as a memory measure, the Rey Auditory Verbal Learning Test. Despite past research which has indicated anterior hemispheric asymmetries and impaired neurocognitive performances in depressives, this research failed to identify any reliable differences between depressed and nondepressed women on any of the neuropsychological measures. These results argue against the frequently held stereotype that depressed individuals typically display impaired performances on neurocognitive

tasks. Furthermore, since the profile of the depressed sample appeared to differ significantly from past studies, a discussion is provided as to how the characteristics of this group may have impacted the results. Implications of these findings for clinical practice and future research are also provided.

ACKNOWLEDGMENTS

Upon the completion of such a monumental endeavor, there are numerous individuals who deserve my utmost and sincerest appreciation. Although it is impossible in this context to individually acknowledge each and every person who has contributed to my success, there are several people who deserve special recognition.

First and foremost, I would like to express my wholehearted gratitude and appreciation to my mentor and dear friend, Dr. David W. Harrison, who five years ago "took a chance on a late bloomer" and granted me the opportunity of a lifetime -- to work and study with him in Virginia Tech's Clinical Psychology Program. He, undoubtedly, has had a major, positive impact upon my life and is largely responsible for my success on both this project and in the Clinical Psychology Program as a whole. I will be forever grateful to Dr. Harrison for all of his advice, guidance, and supervision, as well as the unyielding support and encouragement which he has given to me through my association with him at Tech. Further, he has served as an outstanding scientist/practitioner role model who has gotten me contagiously excited about neuropsychology and clinical research. To say the least, it has been an extreme honor and privilege to work with Dr. Harrison whom I feel is truly deserving of the highest level of commendation that can be bestowed upon him.

I would also like to extend my sincerest appreciation to Drs. Thomas H. Ollendick, Helen J. Crawford, Ellie

Sturgis, and Douglas R. Southard who have so graciously served on my Dissertation Committee. I am truly indebted to each of them for their invaluable advice and generous support which they have provided to me throughout my graduate training at Tech.

Furthermore, to my good friends and colleagues over the years, I extend a very special thank you for all of their support and assistance. Their friendships have certainly made a difference in my life.

Last, but not least, this dissertation is dedicated in honor of my mother, Gladys Roakes Crews, and "Granny," Ellen Bryant Roakes. Without their unyielding and unconditional love, support, and encouragement given to me throughout my life, none of this would have been possible! I shall never be able to put into words the true endearment I feel for them. This project is also dedicated in memory of my late father, William David Crews, and grandfather, John Ernest Roakes, who via their own examples, instilled in me the importance of hard work, integrity, fair play, and a "never-say-never" philosophy long before I undertook this career path. While they may be gone, they will never be forgotten!

Post Script: Finally, some parting advice for aspiring Ph.D. candidates or anyone who dreams of pursuing advanced degrees. To bring your dreams to fruition, there are several tips which I have found very helpful: work hard; remain highly motivated and always do your best; maintain a positive attitude; smile; be persistent and never give up! It can be done!

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INTRODUCTION AND LITERATURE REVIEW

Within the past few years, the neuropsychology of depression has received renewed attention. It appears that this is due at least in part to the National Institute of Mental Health's (1989) designation of the 1990's as the decade of the brain. In the past, an array of methodologies and samples of subjects, including both brain-injured patients and individuals with a diversity of affective disorders have been used to investigate the neurological/neuropsychological correlates of depression.

Some of the earliest studies to shed light on the neuropsychology of depression involved patients with unilateral brain lesions. These clinical lesion studies have generally revealed consistent differences in the affective behavior of subjects with unilateral left versus right lesions (Coffey, 1987). In 1939, Goldstein first reported a high incidence of a "catastrophic reaction" in patients with lesions to the LH. Since then, this depressive catastrophic reaction which has been characterized by negative affect, fear, pessimism, hopelessness, and crying (Davidson, 1984) has frequently been observed in other studies whereas an opposite reaction characterized by indifference, anosognosia, and pathological laughing has been associated with right-sided lesions

(Gainotti, 1972; Sackeim et al., 1982; Starkstein, Robinson, & Price, 1987). For example, Gainotti (1972) examined 160 cases of unilateral cerebral lesions and found that the catastrophic reaction occurred significantly more frequently among left brain-damaged patients as compared to right-side lesioned patients who exhibited an opposite reaction characterized by indifference, anosognosia, and joking. Gasparrini, Satz, Heilman, and Coolidge (1978) administered the Minnesota Multiphasic Personality Inventory to patients with unilateral brain lesion and found that almost 50% of the LH lesioned group had a depression score of $T > 70$ while none of the RH group exhibited this profile. As left and right lesioned patients had been matched for both severity of cognitive and motor dysfunction, this study's findings cannot be totally attributed to differences in such abilities.

Other studies have indicated that patients with left anterior brain lesions are significantly more depressed as compared to patients with any other lesion site (Robinson, Kubos, Starr, Rao, & Price, 1983, 1984; Starkstein et al., 1987). For example, Robinson et al. (1983) found almost two-thirds of their left anterior lesioned group had a cluster of symptoms associated with major depressive disorder. Furthermore, Starkstein et al. (1987) found a strong positive correlation between the severity of the

depression and proximity of the lesion to the left frontal pole for both cortical and subcortical lesions.

While the majority of unilateral lesion studies have indicated the importance of the LH, especially the anterior region, in depressive syndromes, a few studies have failed to support these findings (Folstein, Maiberger, & McHugh, 1977; Grafman, Vance, Weingartner, Salazar, & Amin, 1986). For example, Folstein et al. (1977) studied 20 patients with either left or right-sided strokes and found that 70% of the RH group displayed depressive symptomatology while none of the LH patients exhibited such signs. Similarly, Grafman's and associates' (1986) study of unilateral orbitofrontal lesions also found that right-sided lesions were prone to depression. Thus, while depressive symptomatology is primarily associated with unilateral LH lesions, exceptions do appear to occur.

The catastrophic and indifference reactions seen in clinical lesion studies have been hypothesized to result from a breakdown (due to hemispheric damage) of the reciprocal interaction between the controlling systems of the left and right hemispheres. This is thought to lead to disinhibition of the undamaged hemisphere (Flor-Henry, 1979; Otto, Yeo, & Dougher, 1987; Swartzburg, 1983). For instance, when the RH is no longer "under" LH control due to damage to the left side, the catastrophic reaction may be

released (Flor-Henry, 1979; Swartzburg, 1983).

A diversity of neuropsychological research has demonstrated hemispheric asymmetries in depressed individuals who have no history of brain lesions. Several studies have involved the use of a dichotic listening paradigm which presents auditory stimuli simultaneously to both ears (see Lezak, 1983). One major finding from such investigations has been that depressives, as compared to controls, exhibit evidence of RH dysfunction that may even resemble the performance of right temporal lobe damaged patients (Bruder et al., 1989; Yozawitz et al., 1979). For example, Bruder et al. (1989) found that major depressives showed abnormally large right ear advantage (REA) for CV syllables (primarily due to poor left ear performance) and also displayed a REA for complex tones which is opposite of that typically seen in normal controls. In addition to RH dysfunction, the authors noted that these findings possibly indicate RH overactivation. Other dichotic listening studies have found that depressives, in contrast to controls, did not exhibit the expected REA for verbal material (Johnson & Crockett, 1982; Moscovitch, Strauss, & Olds, 1981). Moscovitch et al. (1981) suggested such findings may indicate that the RH is strongly primed in depressed subjects. However, the absence of the REA for verbal stimuli may also indicate LH dysfunction.

Furthermore, in addition to an absence of a REA for verbal material, Johnson and Crockett (1982) failed to find a left ear superiority for musical chord processing. This may suggest both right and left hemisphere dysfunction in depressives on dichotic listening tasks.

Studies involving the use of a tachistoscope which presents stimuli to the left and right visual fields (and corresponding right and left hemispheres) have also found hemispheric asymmetries in depressives. In a study examining the processing of tachistoscopically presented verbal stimuli, depressed women displayed a trend towards RH superiority as opposed to the LH superiority of normal controls (Silberman, Weingartner, Stillman, Chen, & Post, 1983). It was hypothesized that the RH of depressives may share functions normally performed by the LH in nondepressives. Hence, the RH may be compensating for a relative deactivation of the LH. Crews and Harrison (1994a) investigated the hemispheric processing of tachistoscopically presented happy, sad, and neutral faces in depressed and nondepressed women. Depressed, as compared to nondepressed, women displayed significantly faster reaction times to sad faces presented their right visual fields (LH) and happy faces presented their left visual fields (RH). In light of arousal theory, these results were suggested to reflect differential arousal of both the left

and right hemisphere with a relatively greater arousal of the RH. However, the depressed women also acknowledged elevated levels of anxiety. As it is unknown how anxiety and depression differentially impacted reaction times, these results should be interpreted with caution. In contrast, Bruder et al. (1989), in a tachistoscopic study of depressives and nondepressives, failed to demonstrate differences between groups on verbal and dot enumeration tasks. Thus, while there are some conflicting data across tachistoscopic studies of depression, a number of studies have suggested a heightened RH activation relative to that at the LH.

Other neuropsychological research has involved recordings of depressives' electrodermal activity (EDA). Myslobodsky and Horesh (1978) examined bilateral skin conductance in endogenous and reactive depressives during visual and verbal tasks and tone habituation conditions. Results indicated that EDA was higher at the left, as compared to the right hand, during all conditions for the endogenous group and higher on the left side during the verbal and tone habituation conditions for the reactive depressives. These findings may indicate a heightened activation of the RH in depression if it is presumed that hemispheric influences are largely contralaterally controlled. Likewise, in a study of high-risk subsyndromal

depressives and normal controls, high risk subjects displayed larger left than right-hand skin conductance amplitudes in response to neutral tones (Lenhart & Katkin, 1986). These data support the hypothesis of RH activation in affective disorders.

The brain's electrical activity (electroencephalograms (EEG)), has also been used to investigate hemispheric asymmetries in depressives. Two earlier studies conducted by d'Elia and Perris (1973, 1974) examined quantitative EEG asymmetries in patients with psychotic depression. Results indicated significantly lower within patient variability on the left side versus the RH in depressives. Further, the investigators found that left-sided involvement in depressives was proportional to the degree of depression. These results suggest pronounced LH involvement in depression and that this hemisphere may be "overaroused" relative to the RH. However, it should be noted that psychotic as opposed to nonpsychotic depressives served as subjects in these studies (i.e., d'Elia & Perris, 1973, 1974) with no control groups used for comparisons.

Several investigators have examined resting EEG asymmetries in nonpsychotic depressed subjects and found evidence for heightened right frontal activation in depressives, as compared to their LH and nondepressed controls (Kano, Nakamura, Matsuoka, Iida, & Nakajima, 1992;

Schaffer, Davidson, & Saron, 1983). These studies lend support to the hypothesis of increased RH activation in the frontal lobes of depressives. Flor-Henry (1978) has also reported an increased RH activation in depression, especially in the right temporal lobe.

In contrast, other research of resting EEG activity has indicated a decreased activation of the left frontal region in depressives as compared to controls (Davidson, 1992; Henriques & Davidson, 1991). However, similar to the d'Elia and Perris (1973, 1974) studies, other studies have indicated alternative patterns of activation asymmetries in depressives. For example, Knott and Lapierre (1987) found EEG evidence for deactivation of the right side in depression whereas Davidson, Chapman, and Chapman (1987) found that depressives exhibit decreased right-parietal activation. Hence, at present, the EEG data are suggestive of a heightened right-sided activation relative to that at the LH in depression although such EEG findings have not been consistently replicated across all studies (Swartzburg, 1983).

Measures of regional cerebral blood flow (rCBF) have been used to examine hemispheric asymmetries in depressives. For example, Delvenne et al. (1990) examined rCBF of major depressives and controls using single photo emission computed tomography (SPECT). Endogenous depressives

evidenced significantly lower cortical blood flow in the LH as compared to controls. Similarly, Mathew et al. (1980) examined the rCBF of 13 patients with major depression and 13 controls. Depressives exhibited significantly lower cerebral blood flow values for the LH as compared to controls. Flow values were also negatively correlated with the depth of depression. Together these results indicate hypoperfusion of the LH in depression which suggests neural hypoactivity (Mathew et al., 1980).

Positron emission tomography (PET) has been employed to examine the glucose metabolic rates in various cerebral regions (Schwartz, Baxter, Mazziotta, Gerner, & Phelps, 1987). In their study of cerebral glucose metabolism, Baxter et al. (1989) found that the rate for the left dorsal anterolateral prefrontal cortex divided by the rate for the whole ipsilateral hemisphere in major depressives was significantly lower as compared to controls. There was also a negative correlation between this ratio and depression ratings. Other PET studies have found evidence of decreased rCBF rates in the left anterior cingulate and left dorsolateral prefrontal cortex of major depressives (Bench et al., 1992; Dolan et al., 1992). Dolan et al. (1992) also found that a cognitively impaired depressed group versus a nonimpaired depressed group displayed decreases of rCBF in the left anterior medial prefrontal cortex. This finding

suggests that cognitively impaired depressives may have somewhat different cortical abnormalities than nonimpaired depressives. Additionally, Baxter et al. (1985) found no significant differences in left-right asymmetries in metabolic rates for unipolar depressives as compared to controls, but there was a subgroup of depressives with lower left frontal cortical rates. This subgroup could not, however, be distinguished from other depressives on clinical grounds. In contrast, other studies (e.g., Hurwitz et al., 1990) have found significant reductions for both anterior left and right cortical regions, with metabolic reductions occurring more frequently in the right versus the left regions. Thus, while most PET studies lend support to the hypothesis of left frontal dysfunction/hypoactivation in depression, other abnormal metabolic patterns have been found which may possibly be due to differences between samples of depressives tested, specific procedural techniques, and/or accuracy of PET measurement (Phelps, Mazziotta, Baxter, & Gerner, 1984).

It must be cautioned that the preceding review may represent an oversimplification of the importance (role) of the level (cortical, subcortical) and type of brain pathology in depression. For example, Gilley (1990) found differences in the severity of depressive symptomatology across three neurodegenerative disorders. Specifically,

depression was most severe in Parkinson's disease (subcortical), intermediate in subcortical vascular disease, and least severe in Alzheimer's disease (cortical). Thus, depression may also be a function of the anatomical level and type of brain involvement.

In sum, evidence from a diversity of neuropsychological research, including clinical lesion, perceptual, electrodermal, EEG, SPECT, and PET studies suggest that depression is associated with heightened RH activity (especially over the frontal region) relative to that at the LH. Similar to what has been described in studies cited herewithin, this differential activation may occur via either an increase in the activity of the RH or by a decrease in LH activity (Otto, Yeo, & Dougher, 1987). It should be noted that these studies do not prove that depression is caused by such hemispheric asymmetries as the temporal cause and effect relationship between this differential activation and depression is unknown, as well as the possible influence of other variables (e.g., stressors, biochemical influences) on the expression of depression. Rather, these studies should be viewed as patterns of cerebral activity that correlate with the expression of depression (Baxter et al., 1989). Finally, as various studies have found dissimilar patterns of activation, these conclusions are not unequivocal.

Neuropsychological Tests Deficits Associated with Depression

Intimately related to the neuropsychology of depression is research which has investigated the neuropsychological test performances of depressives. A number of studies have found impairments in depressives on tests reported to be sensitive to executive functions (anterior cerebral regions, see Luria, 1973). Depressives have been found to display impaired performances relative to controls (nondepressives) on the Trail Making Test (Fisher, Sweet, & Pfaelzer-Smith, 1986; Rush, Weissenburger, Vinson, & Giles, 1983; Shipley et al., 1981), the Stroop Color-Word Test (Fisher et al., 1986) as well as the Wisconsin Card Sorting Test (Martin, Oren, & Boone, 1991) where perseverative responses have been noted. Verbal fluency has also been shown to be impaired in depressives (Beatty, Wonderlich, Staton, & Ternes, 1990; Hart, Kwentus, Taylor, & Harkins, 1987). For example, Hart et al. (1987) found decreased verbal fluency on the Controlled Oral Word Association Test among depressed as compared to nondepressed subjects. Such measures have been suggested to be most sensitive to anterior dysfunction, especially of the left frontal region (see Kolb & Wishaw, 1990; Lezak, 1983). Additionally, depressives have displayed significant deficits on the Left Hemisphere Lateralization Scale as well as the Right Frontal Localization Scale of the Luria-Nebraska Neuropsychological

Battery (LNNB) (Newman & Silverstein, 1987). However, this group of depressives also displayed psychomotor retardation which may have influenced these results.

Impairments have been observed in the psychomotor performances of depressed patients (Cohen, Weingartner, Smallberg, Pickar, & Murphy, 1982; Cornell, Suarez, & Berent, 1984; Hart, Kwentus, Wade, & Hamer, 1987; Rogers, Lees, Smith, Trimble, & Stern, 1987). For example, depressives, relative to controls, have demonstrated impairments in their motor reaction times (Cornell et al., 1984) as well as their hand dynamometer performances (Cohen et al., 1982). Studies have also unveiled an association between motor deficits and both mild and severe levels of depression. Increasing severity of depression has been strongly associated with motor performance impairments, especially those requiring sustained effort (Cohen et al., 1982).

Depressives have also displayed impairments on various tests of abstraction reasoning ability (Braff & Beck, 1974; Clark et al., 1985; Donnelly, Waldman, Murphy, Wyatt, & Goodwin, 1980; Newman & Sweet, 1986; Savard, Rey, & Post, 1980; Shipley et al., 1981; Watson, Davis, & Gasser, 1978). For example, Donnelly et al. (1980) found that depressives displayed significant deficits (i.e., increased errors) on the Category Test relative to controls. Although

abstraction is likely associated with frontal lobe functioning (Stuss & Benson, 1984), it should be cautioned that abstraction ability may be disrupted by dysfunction in a number of functionally discrete brain areas (e.g., tertiary areas of the posterior cortex) or via diffuse cerebral dysfunction (Luria, 1973).

The posterior brain regions have also been associated with neuropsychological deficits in depressives. A number of researchers have found consistent impairments in right posterior-sensitive tasks such as visuospatial processing and constructional tasks (Dean, Gray, & Seretny, 1987; Fromm & Schopflocher, 1984; Gray, Dean, Rattan, & Cramer, 1987; Kronfol, Hamsher, Digre, & Waziri, 1978; Shipley et al., 1981; Watson et al., 1978). For example, in their study of moderate to severe depressives, Kronfol et al. (1978) found impaired performances (compared to medical patients) on the following right parietal lobe tasks: Judgment of Line Orientation, 3-dimensional Constructional Praxis, and Facial Recognition. Fromm and Schopflocher (1984) and Gray et al. (1987) have also found selective impairments in visuospatial processing on an expanded Halstead-Reitan Neuropsychological battery administered to a group of depressed patients. Furthermore, Cassens, Wolfe, & Zola (1990) have stated that visuospatial and visuomotor tasks are consistently impaired in individuals with different subtypes of depression (e.g.,

reactive, endogenous).

Depressed individuals appear to be susceptible to a diversity of memory impairments (Cassens et al., 1990). Two research groups have found performance deficits in depressives on major subfunctions of the Wechsler Memory Scale including: Mental Control, Verbal Learning, and Visual Reproduction (Breslow, Kocsis, & Belkin, 1980; Stromgren, 1977). Similarly, Hart et al. (1987) found significantly impaired performances on the Logical Memory and Visual Reproduction portions of the Wechsler Memory Scale in depressives as opposed to nondepressives. Results of the Verbal Learning (also Logical Memory) and Visual Reproduction subfunctions suggest left and right hemispheric dysfunction respectively (see Bigler, 1988). Other studies have also found evidence of LH dysfunction on memory tests. Impairments have been observed in depressives' short-term verbal memory (Beatty et al., 1990; Cohen et al., 1982; Coughlan & Hollows, 1984; Fromm & Schopflocher, 1984; Sternberg & Jarvik, 1976; Weingartner, Cohen, Murphy, Martello, & Gerdt, 1981; Wolfe, Granholm, Butters, Saunders, & Janowsky, 1987), long-term memory (Weingartner et al., 1981), sentence repetition (Kronfol et al., 1978), and recall of a story (Breslow, Kocsis, & Belkin, 1981). For example, Wolfe et al. (1987) found that depressed, as compared to control subjects, displayed significant

impairments of verbal recall as measured by the Rey Auditory Verbal Learning Test (Wolfe et al., 1987). Additionally, verbal recognition has been found to be impaired in depressives (Frith et al., 1983; Watts, Morris, & MacLeod, 1987).

RH memory tasks have also shown impairments in depressives. These deficits include short-term nonverbal/visuospatial memory (Fromm & Schopflocher, 1984; Sternberg & Jarvik, 1976), visual memory (Deptula & Yozawitz, 1984), and long-term nonverbal memory (Dean et al., 1987). For example, Fromm and Schopflocher (1984) found that both psychotic and nonpsychotic depressives displayed impairments in the retention of nonverbal information as assessed by an expanded Halstead-Reitan Battery.

Based on the findings across a diversity of neuropsychological studies (ex., EEG and PET) of the association between the frontal cortical regions and depression, it seems plausible that many of the memory/posterior brain region test deficits that have been associated with depression may, at least, be partly due to frontal lobe dysfunction. For instance, studies which have found decrements in depressives on tests purported to be sensitive to posterior cerebral regions have also found deficits on sustained attention/motivation (Cassens et al.,

1990; Cohen et al., 1982), vigilance (Frith et al., 1983), and concentration tasks (Abrams & Taylor, 1987; Newman & Sweet, 1986) which have subsequently been hypothesized to play roles in the impairment of these test performances. Although such attentional and concentration abilities may arise from dysfunction in a myriad of brain areas (Lezak, 1983; Luria, 1973), the frontal lobes have been suggested to play an important role in vigilance levels (Luria, 1973), attentional processes (Stuss & Benson, 1984) as well as maintaining active effort/motives for voluntary recall (Luria, 1973). Further, the psychomotor retardation/slow speeds reported to influence depressives' test performances (e. g., see Miller, 1975; Weckowicz, Nutter, Cruise, Yonge, Cairns, 1978) may likely be attributable to frontal lobe dysfunction (Stuss & Benson, 1984). Various studies have also indicated that the frontal lobes are involved in a diversity of tasks purported to be sensitive to posterior regions (e.g., spatial orientation; see Kolb & Whishaw, 1990). Hence, the abnormal frontal lobe activation asymmetries related to depression may promote impairments of tasks that have been associated with other cerebral regions. While it seems probable that many of the test impairments seen in depressives may be, at least partly, due to frontal lobe dysfunction, this hypothesis should be regarded as speculative until it can be verified empirically.

In sum, depressed individuals may exhibit a wide diversity of neuropsychological deficits suggesting both left and/or right hemisphere involvement. It seems probable that these impairments may at least be partly due to executive dysfunction associated with the anterior cerebrum. However, due to the failure of many studies to precisely identify their samples, use rigorous methodology and adequate control groups, as well as the inclusion (grouping) of subjects of different ages, genders, and depression subtypes, it remains unclear if there are specific patterns of neuropsychological/cognitive deficits associated with specific subtypes of depression (Cassens et al., 1990; McAllister, 1981; Miller, 1975). Furthermore, Cassens et al. (1990), in their extensive review of the neuropsychology test performance literature as related to depression, have indicated that the majority of studies in this area have involved medicated, psychiatric inpatients. Hence, results of these studies may not be generalizable to unmedicated outpatients.

There appears to be a relative absence of neuropsychological test performance studies which have focused exclusively on depressed versus nondepressed women. The purpose of the present research was to examine the neuropsychological test performances of young, unmedicated, outpatient depressed women, as compared to a matching

nondepressed control group. This study was also based upon neurological/neuropsychological evidence which has suggested that depressed persons may display decreased activation of the left anterior cerebrum relative to that at the right, research indicating that mixed samples of depressives may exhibit impaired performances on neuropsychological tasks suggested to be sensitive to anterior brain functioning, and the hypothesized influence of the frontal brain regions on memory tasks. Further, relatively few studies have examined the impact of depression on executive functions (Cassens et al., 1990; Martin et al., 1991). Hence, this research focused primarily on standardized neuropsychological tests that have been suggested to be sensitive to executive functions and verbal memory. In particular, the anterior regions have been associated with diverse executive functions including motor functioning/psychomotor speed, abstraction, sequencing abilities, response inhibition, verbal and design fluency, as well as concentration and vigilance (Luria, 1973; Stuss and Benson, 1984).

Based on the left/right anterior cerebral asymmetries associated with depression, it was predicted that depressed, as opposed to nondepressed, women would exhibit deficits on neuropsychological tests suggested to be sensitive to the left anterior cerebrum. Specifically, depressed, as compared to nondepressed, women were predicted to display

impaired motor (dynamometer) performances, especially at the right hand (LH controlled). Depressives, as opposed to nondepressives, were expected to display decreased sustained concentration and vigilance as reflected by poorer performances on tasks requiring number reversals (i.e., backwards digits) and on later trials of a serial subtraction task. It was hypothesized that depressed women (versus controls) would demonstrate slower task-completion times on tests requiring sequencing and shift of perceptual set abilities. Depressives were also predicted to exhibit deficits in response inhibition as well as decreased verbal fluency. Further, it was hypothesized that depressed women would display a primacy effect on a test of immediate verbal memory. In contrast, since previous research has suggested that depression is associated with a heightened right frontal activation relative to that at the left frontal region, depressed women were not expected to display impaired design fluency or left-handed motor performances.

Method

Subjects

Subjects consisted of 30 right-handed, depressed and 30 right-handed, nondepressed women. Depressed subjects were comprised of clinical outpatients who had received a primary diagnosis of Major Depression via the Anxiety Disorders

Interview Schedule - Revised (ADIS-R; DiNardo & Barlow, 1988a) and who also scored within the depressed range on the Beck Depression Inventory (Beck, 1972). Within the depressed group, 20 women also met the criteria for Generalized Anxiety Disorder, while three fulfilled the criteria for Dysthymic Disorder. These volunteer women were recruited from undergraduate psychology courses, via flyers, newspaper and radio announcements, and from university/college counseling centers via prearranged collaborative agreements. Specifically, the agreements were limited to the mental health professionals at these agencies asking depressed subjects (who would likely meet inclusionary criteria) if they would be interested in voluntarily participating in the research study described herewithin. If interest was expressed, the mental health professionals obtained their clients' permission via signed Release of Information forms (See Appendix A) to provide their names and telephone numbers to the study's first author. Clients were then contacted by the senior author to arrange a session to conduct the project's assessments. No deliberate coercion was involved in recruiting the depressed subjects by either the mental health professionals or the first author. At the end of the testing session, subjects were debriefed and informed that their results would be provided to their therapists/counselors if written

permission was given to the first author to do so. None of the subjects requested this service; thus, all results remained strictly confidential.

Nondepressed subjects consisted of volunteer women who had been recruited (via flyers/sign-up sheets) from town and university settings who were not diagnosed as depressed according to the ADIS-R and who scored within the nondepressed range on the BDI. These nondepressed women were selected (i.e., matched) to approximate the ages and intelligence levels of the depressive group. Table 1 provides an overview of subjects' demographic data.

Both depressed and nondepressed women were excluded if the subjects reported any of the following: past or present history of neurological problems or psychiatric disorders (other than depressive disorders), alcoholism or drug abuse, learning disabilities, concurrent medication/drug (i.e., antidepressants) usage, eating disorders, or current medical illness.

Group Classification Measures

Handedness was determined using a validated self-report questionnaire (Coren, Porac, & Duncan, 1979) consisting of 13 items which inventories four types of lateral preference (hand, foot, eye, and ear) (See Appendix B). Average concordance between self-report and behavioral measures for

the test is stated to be .90. Items were scored as +1 for "right-handed," -1 for "left-handed," or 0 for "both" (right or left) responses. The criterion for right-hand dominance and inclusion in the study was a score of +6 or more.

Depressive disorders were evaluated via the Anxiety Disorders Interview Schedule - Revised (ADIS-R; DiNardo & Barlow, 1988a) (See Appendix C). This is a structured diagnostic interview which permits differential diagnosis of DSM-IV (American Psychiatric Association, 1994) anxiety and depressive disorders (DiNardo & Barlow, 1988b). Only those sections of the ADIS-R that assessed depressive disorders were used in this study for classification purposes.

Depressive symptomatology was assessed at the time of neuropsychological testing using the validated self-report Beck Depression Inventory (Beck, 1972) (See Appendix D). Scores on this 21-question measure may range from 0 to 63. Similar to past studies (see Crews & Harrison, 1994a, 1994c), subject scores of 0 - 9 (BDI normal range) were considered nondepressed while subjects who scored 16 (BDI mild depression, Beck, 1972) or more were considered depressed.

Depressive thoughts and cognitions were assessed using the validated self-report Crandell Cognitions Inventory (CCI; Crandell & Chambliss, 1986) (See Appendix E). Scores

on this 45-item inventory may range from 34 to 170 with scores greater than 101 generally indicating depressive thinking (Crandell, Smail, & Vice, 1993). This measure was not used as a criterion for inclusion in this study.

Anxiety was assessed using the validated self-report State-Trait Anxiety Inventory (Spielberger, 1983) (See Appendix F). This is a 40-item questionnaire which inventories both state and trait anxiety. The inventory was not used as a criterion measure for inclusion in this study.

A history questionnaire was administered prior to testing to assess for both past and present neurological and psychiatric problems, learning disabilities, alcoholism and drug abuse, current medication/drug usage, eating disorders, or current medical illnesses (See Appendix G). Those individuals with such problems or histories of such were excluded from this study.

Two Wechsler Adult Intelligence Scale - Revised (WAIS-R) subtests (Wechsler, 1981) were also given to subjects. Tests consisted of one Verbal Scale subtest (i.e., Vocabulary) and one Performance Scale subtest (i.e., Block Design). These measures were used to obtain estimates of the women's levels of verbal and nonverbal intellectual functioning (i.e., IQ) and aid in evaluating the comparability of the depressed and nondepressed groups.

Neuropsychological Tests and Measures

Design Fluency Test. The Design Fluency Test is a standardized measure of nonverbal fluency (i.e., design) (Jones-Gotman & Milner, 1977). The test is comprised of two parts. The first section, the Free Condition, requires subjects to invent as many drawings as possible in five minutes that are not actual objects or figures that can be named. The second part, the Fixed Condition, requires subjects to compose as many drawings as possible in four minutes which consist of only four lines. This test has been suggested to be most sensitive to the right frontal region (Jones-Gotman & Milner, 1977).

Digit Span Test. The Digit Span Test is a standardized verbal subtest of the Wechsler Adult Intelligence Scale - Revised (Wechsler, 1981). This test has been termed a classic measure of attention (Lezak, 1983). The test consists of two parts: Digits Forward and Digits Backwards. In Digits Forward, subjects are required to sequentially repeat strings of digits which have been presented to them by the examiner. Digits Backwards requires subjects to relay strings of digits presented to them in reverse order. Testing on both parts of the test continues until two consecutive trials that are comprised of the same number of digits are failed. Such attentional and concentrational

abilities have been associated with anterior lobe functioning (Luria, 1973; Stuss & Benson, 1984).

Dynamometer (Dodrill, 1978a). A hand dynamometer is a mechanical instrument used as a standardized measure of hemispheric motor functioning including hand grip strength, perseveration, and fatigue (Dodrill, 1978a; Harrison & Pauly, 1990; Huntzinger, 1989). The hand grip strength task requires subjects to squeeze the device as hard as possible. A second trial with the same hand immediately follows which requires subjects to squeeze only half as hard to obtain a measure of perseveration. Subjects are then required to squeeze the dynamometer as hard as they can five times in rapid succession to assess motor fatigue. Such motor functions have been associated with anterior cerebrum functioning (Stuss & Benson, 1984). Poor performances may indicate anterior cerebral dysfunction which is contralateral to the hand tested as distal extremities are controlled by the contralateral anterior hemisphere (Dodrill, 1978a; see Kolb & Whishaw, 1990). The dynamometer records hand grip strength in kilograms (kg).

FAS Test (also known as the Controlled Oral Word Association Test). This task has been suggested to be a standardized measure of verbal fluency (Borkowski, Benton, &

Spreen, 1967). The test is comprised of three word production trials. Trial one requires subjects to name (or in the case of the present study, write out) as many words as possible beginning with the letter "F." On trial two and three, subjects are instructed to generate as many words as they can that begin with the letters "A" and "S" respectively. Each trial is one minute in duration. Poorer performances on verbal fluency tasks have been associated with left anterior cerebrum dysfunction (Benton, 1968).

Rey Auditory Verbal Learning Test (RAVL, Rey, 1964).

This test is suggested to be a standardized measure of immediate verbal memory (see Lezak, 1983). Primacy and recency effects may also be observed by dividing each word list into thirds (see Huntzinger, 1989). The test consists of five presentations of a 15-word list. Each presentation is followed by a free recall period that requires subjects to recite as many words as possible from the list. The anterior cerebrum and, in particular, the left frontal region, have been suggested to be involved in short-term verbal memory abilities (Stuss et al., 1982; Stuss & Benson, 1984; see also Kolb & Whishaw, 1990).

Serial Sevens. This task has also been called a classic test for the evaluation of attention (Lezak, 1983).

Subjects are instructed to subtract 7 from 100 and continue subtracting by seven until they can go no further. All subtracting by subjects is announced verbally to the examiner. Such attentional/vigilance processes have been associated with anterior cerebrum functioning (Luria, 1973; Stuss & Benson, 1984).

Stroop Color and Word Test (Stroop, 1935; Golden, 1978). This standardized test (Golden, 1978) has been suggested to assess response inhibition (see Kolb & Whishaw, 1990), the effects of perceptual interference (the Stroop interference effect; see Golden, 1978; Lezak, 1983), and concentration (Dodrill, 1978b). The test is composed of three separate tasks. The first task, consisting of 100 items, requires subjects to correctly read as quickly as possible the names of colors (red, green, and blue) which are printed in black ink and randomly arranged in five columns. Task two items consist of 100 groupings of X's (i.e., XXXX) that are printed in either red, green, or blue ink. Subjects are required to name the colors as quickly as possible. In task three, subjects are presented a list of 100 color-words (red, green, and blue) where each word is printed in a color ink (either red, green, or blue) which is different from the color's printed name. Subjects are required to ignore the printed name and provide only the

name of the colored ink in which the word is printed as quickly as possible. For all pages, there is a 45 second time limit. The Stroop Color and Word Test has been suggested to be sensitive to the left hemisphere (Golden, 1978) and especially left anterior brain functioning (Perret, 1974).

Trail Making Tests, Parts A and B. The Trail Making Test is a standardized measure included in the Halstead-Reitan Neuropsychological Battery. The test is comprised of two distinct sections, Parts A and B (see Bigler, 1988). Part A is composed of 25 numbers which are randomly arranged on a page. Subjects are required to sequentially connect the numbers via drawn lines as quickly as possible until they reach the number 25. Part B consists of 13 numbers (1-13) and 12 letters (A-L) which are randomly arranged on a page. Subjects are required to start with the number one and alternate between sequential numbers and letters of the alphabet via drawn lines as quickly as possible until they reach the last number (13). This test appears to tap the abilities to sequence, shift perceptual sets, and search visually, as well as concentration/vigilance and psychomotor speed (see Huntzinger, 1989; Lezak, 1983; Reitan, 1958). Such abilities have been suggested to reflect executive region functioning (Luria, 1973; Stuss & Benson, 1984; see

also Kolb & Whishaw, 1990).

Procedures

This research was approved by the Institutional Review Board and Human Subjects Committee at Virginia Polytechnic Institute and State University.

Assessment procedures for each subject were conducted during one session by the first author. Upon arrival, a five-minute, rapport-building session was conducted during which time the purpose of the study was explained and informed consent obtained (See Appendix H). This was followed by administration of the handedness scale (Coren, et al., 1979), the Beck Depression Inventory (Beck, 1972), the State-Trait Anxiety Inventory (Spielberger, 1983), a brief history questionnaire, and the Crandell Cognitions Inventory (Crandell & Chambliss, 1986). Women who reported significant difficulties on the history questionnaire were debriefed and excused.

Next, sections of the ADIS-R (DiNardo & Barlow, 1988a) were administered to assess for depressive disorders. To be included in the study, congruency was required between subjects' BDI scores and their diagnostic statuses as assessed via the ADIS-R. Inclusion in the depressed group required a BDI score of 16 or more and an ADIS-R diagnosis of major depression while the nondepressed group required a

BDI score of 9 or less and no ADIS-R depression diagnosis. Subjects who displayed conflicting BDI scores and ADIS-R diagnoses were debriefed and excused.

The Vocabulary (See Appendix I) and Block Design (See Appendix J) subtests of the Wechsler Adult Intelligence Scale - Revised (Wechsler, 1981) were then given to obtain an estimate of subjects' verbal and performance intellectual abilities (i.e., IQs).

Neuropsychological testing was then initiated. All subjects were administered the following neuropsychological tests while adhering to each test's standardized administration procedures: Design Fluency Test (See Appendix K), Digit Span subtest of the WAIS-R (See Appendix L), Dynamometer Tests of Grip Strength, Perseveration and Fatigue (See Appendix M), FAS Test (See Appendix N), Rey Auditory Verbal Learning Test (See Appendix O), Serial Sevens Test (See Appendix P), Stroop Color and Word Test (See Appendix Q), and the Trail Making Test (Parts A and B) (See Appendix R).

Order of neuropsychological test administration was determined via a Latin square design to control for potential practice and fatigue effects. For the dynamometer testing, the device was reset after all trials and the instrument's scale was always turned away from subjects. Hand order for dynamometer testing was alternated

across subjects. Upon completion of all testing, subjects were debriefed and excused.

Results

Descriptive Measures

To compare groups (depressed vs. nondepressed) on the descriptive measures, a Multivariate Analysis of Variance (MANOVA) was conducted using the following as dependent variables: ages in years; educational level in years; handedness scale scores; Crandell Cognitions Inventory (CCI) Total, Detachment, Self-rated Inferiority, Helplessness, and Hopelessness scores; State-Trait Anxiety Inventory (STAI) State and Trait anxiety scores; WAIS-R Vocabulary subtest raw and scaled scores; and the WAIS-R Block Design subtest raw and scaled scores. Table 1 provides a summary of the group means and standard deviations for each measure while Table 2 presents an overview of the MANOVA results for these descriptive measures.

For the MANOVA, there was an overall significant effect of group (Hotelling's $F(17,42) = 74.02, p < .0001$). A number of the univariate ANOVA results were also significant for the descriptive data. Significant main effects of group were found for the CCI Total, $F(1,58) = 509.32, p < .0001$; Detachment, $F(1,58) = 391.61, p < .0001$; Self-rated Inferiority, $F(1,58) = 330.35, p < .0001$; Helplessness, F

Table 1. Group Means and Standard Deviations for the Descriptive Measures

TABLE 1

Group Means and Standard Deviations for the Descriptive Measures

| Variable | Depressed | | Nondepressed | |
|-----------------------------------|-----------|---------|--------------|---------|
| | Means | SD | Means | SD |
| Age (in years) | 20.33 | (3.90) | 20.20 | (3.47) |
| Educational Level (in years) | 14.37 | (1.63) | 14.40 | (1.33) |
| Handedness Scale Scores | 10.37 | (2.08) | 9.93 | (2.08) |
| Beck Depression Inventory Scores | 27.93 | (7.79) | 2.50 | (2.37) |
| Crandell Cognitions Inventory | | | | |
| Total Scores | 119.27 | (15.01) | 45.20 | (9.89) |
| Crandell Cognitions Inventory | | | | |
| Detachment Scale Scores | 27.93 | (3.72) | 10.90 | (2.89) |
| Crandell Cognitions Inventory | | | | |
| Self-rated Inferiority Scores | 34.03 | (5.56) | 12.73 | (3.22) |
| Crandell Cognitions Inventory | | | | |
| Helplessness Scale Scores | 32.77 | (4.79) | 13.27 | (3.16) |
| Crandell Cognitions Inventory | | | | |
| Hopelessness Scale Scores | 24.20 | (4.48) | 8.30 | (1.99) |
| State Trait Anxiety Inventory | | | | |
| State Anxiety Scores | 49.77 | (10.57) | 27.63 | (5.14) |
| State Trait Anxiety Inventory | | | | |
| Trait Anxiety Scores | 62.37 | (5.23) | 30.10 | (5.68) |
| WAIS-R Vocabulary Raw Scores | 55.27 | (6.52) | 56.13 | (5.53) |
| WAIS-R Vocabulary Scaled Scores | 13.43 | (2.03) | 13.50 | (2.08) |
| WAIS-R Block Design Raw Scores | 38.30 | (8.01) | 37.27 | (10.47) |
| WAIS-R Block Design Scaled Scores | 12.53 | (3.00) | 12.30 | (3.77) |

Table 2. Summary of the MANOVA Results for the
Descriptive Measures

TABLE 2

Summary of the MANOVA Results for the Descriptive Measures

| Source | df | SS | MS | F | p |
|----------------------------------------------|--------|------------|------------|--------|---------|
| Hypothesis of an Overall Group Effect | | | | | |
| Hotelling-Lawley Trace (17,42) | | | | 74.02 | <.0001* |
| Age | | | | | |
| Group | (1,58) | .2667 | .2667 | 0.02 | <.8894 |
| Education | | | | | |
| Group | (1,58) | .0167 | .0167 | 0.01 | <.9311 |
| Handedness Scale | | | | | |
| Group | (1,58) | 2.8167 | 2.8167 | 0.65 | <.4229 |
| Crandell Cognitions Inventory | | | | | |
| Total Scores | | | | | |
| Group | (1,58) | 82288.0667 | 82288.0667 | 509.32 | <.0001* |
| Detachment Scale | | | | | |
| Group | (1,58) | 4352.0167 | 4352.0167 | 391.61 | <.0001* |
| Self-rated Inferiority Scale | | | | | |
| Group | (1,58) | 6805.3500 | 6805.3500 | 330.35 | <.0001* |
| Helplessness Scale | | | | | |
| Group | (1,58) | 5703.7500 | 5703.7500 | 346.32 | <.0001* |
| Hopelessness Scale | | | | | |
| Group | (1,58) | 3792.1500 | 3792.1500 | 316.42 | <.0001* |
| State-Trait Anxiety Inventory | | | | | |
| State Anxiety Scale | | | | | |
| Group | (1,58) | 7348.2667 | 7348.2667 | 106.43 | <.0001* |
| Trait Anxiety Scale | | | | | |
| Group | (1,58) | 15617.0667 | 15617.0667 | 523.68 | <.0001* |

TABLE 2, continued

| Source | df | SS | MS | F | p |
|------------------------------------|--------|---------|---------|------|--------|
| WAIS-R Block Design Subtest | | | | | |
| Raw Score | | | | | |
| Group | (1,58) | 16.0167 | 16.0167 | 0.18 | <.6693 |
| Scaled Score | | | | | |
| Group | (1,58) | .8167 | .8167 | 0.07 | <.7900 |
| WAIS-R Vocabulary Subtest | | | | | |
| Raw Score | | | | | |
| Group | (1,58) | 11.2667 | 11.2667 | 0.27 | <.6039 |
| Scaled Score | | | | | |
| Group | (1,58) | .0667 | .0667 | 0.02 | <.9004 |

(1,58) = 346.32, $p < .0001$; and Hopelessness, $F(1,58) = 316.42$, $p < .0001$ scores. On each of these measures, depressed women obtained significantly higher scores than did their nondepressed counterparts. For the STAI State and Trait anxiety scores, significant main effects of group were found respectively: $F(1,58) = 106.43$, $p < .0001$, $F(1,58) = 523.63$, $p < .0001$. Specifically, depressed women demonstrated significantly higher state and trait anxiety scores than did nondepressed women. In contrast, no significant group differences were found for the dependent variables of age, educational level, handedness, or WAIS-R Block Design and Vocabulary subtests (raw and scaled scores).

To more closely examine the relationships between women's BDI scores and their scores on other measures of depression and anxiety (i.e., Crandell Cognitions Inventory and State-Trait Anxiety Inventory Scores), post hoc Point-Biserial correlation coefficient analyses were performed. Table 3 provides an overview of these analyses.

There were significant, positive correlations between women's BDI scores and their Crandell Cognitions Inventory Total ($r = .95$, $p < .0001$), Detachment ($r = .93$, $p < .0001$), Self-rated Inferiority ($r = .92$, $p < .0001$), Helplessness ($r = .93$, $p < .0001$), and Hopelessness ($r = .92$, $p < .0001$) scores. Higher BDI scores were associated with higher

Table 3. Summary of Correlations between BDI Scores
and Other Measures of Depression and Anxiety

TABLE 3

Summary of Correlations between BDI Scores and Other Measures
of Depression and Anxiety

| Source | r | p |
|-----------------------------------------|-----|----------|
| BDI x CCI Total Scores | .95 | <.0001 * |
| BDI x CCI Detachment Scores | .93 | <.0001 * |
| BDI x CCI Self-rated Inferiority Scores | .92 | <.0001 * |
| BDI x CCI Helplessness Scores | .93 | <.0001 * |
| BDI x CCI Hopelessness Scores | .92 | <.0001 * |
| BDI x STAI State Anxiety Scores | .80 | <.0001 * |
| BDI x STAI Trait Anxiety Scores | .95 | <.0001 * |

BDI = Beck Depression Inventory

CCI = Crandell Cognitions Inventory

STAI = State Trait Anxiety Inventory

* = significant when using the Bonferroni-corrected alpha level
(.05/7 = .007)

scores on all of the Crandell Cognitions Inventory scales.

Similarly, the correlations of STAI State anxiety ($r = .80, p < .0001$) and Trait scores ($r = .95, p < .0001$) with women's BDI scores were also highly significant and in a positive direction. Higher BDI scores were related to higher scores on both the STAI State and Trait anxiety scales.

Neuropsychological Tests

To compare groups (depressed vs. nondepressed) on the neuropsychological tests, two hypothesis-driven Multivariate Analyses of Variance (MANOVAs) were performed. One MANOVA was performed for the neuropsychological measures purported to be sensitive to the left anterior cerebrum using the WAIS-R Digit Span subtest scaled scores; right-hand full grip strength, percent change, and fatigue scores on the dynamometer; FAS Verbal Fluency Test words generated; Serial Sevens Tests total errors and task completion times; Stroop Color and Word Test total color-words named; and the Trail Making Test, Part B total task completion times as dependent variables. Table 4 provides an overall summary of the group means and standard deviations for each neuropsychological measure, while Table 5 presents an overview of the MANOVA results for the neuropsychological variables purported to be sensitive to the left anterior cerebrum.

**Table 4. Neuropsychological Test Group Means and
Standard Deviations**

TABLE 4
Neuropsychological Test Group Means and Standard Deviations

| Variable | Depressed | | Nondepressed | |
|-----------------------------------|-----------|---------|--------------|---------|
| | Mean | SD | Mean | SD |
| Design Fluency Test | | | | |
| Free Novel Output | 32.23 | (10.98) | 32.27 | (12.65) |
| Fixed Novel Output | 26.53 | (8.56) | 26.00 | (9.27) |
| Digit Span Test | | | | |
| Forwards | 10.23 | (2.01) | 10.47 | (1.55) |
| Backwards | 8.33 | (2.81) | 9.00 | (2.35) |
| Total Raw Scores | 18.57 | (4.34) | 19.47 | (3.29) |
| Scaled Scores | 12.50 | (2.70) | 12.93 | (2.38) |
| Dynamometer | | | | |
| Full Grip Strength (in kg) | | | | |
| Right Hand | 30.80 | (4.23) | 31.27 | (5.31) |
| Left Hand | 28.13 | (4.33) | 29.53 | (4.97) |
| Percent Change Scores | | | | |
| Right Hand | 42.79 | (15.60) | 44.15 | (18.41) |
| Left Hand | 45.55 | (20.29) | 46.62 | (16.63) |
| Fatigue Scores (in kg) | | | | |
| Right Hand | 2.93 | (1.85) | 4.17 | (1.56) |
| Left Hand | 3.43 | (2.31) | 3.97 | (2.77) |
| FAS Test | | | | |
| Trial 1, "F" Words | 14.00 | (3.76) | 13.73 | (2.83) |
| Trial 2, "A" Words | 11.83 | (3.33) | 11.97 | (2.70) |
| Trial 3, "S" Words | 15.73 | (3.53) | 14.10 | (2.73) |
| Total Words | 41.57 | (9.06) | 39.80 | (6.72) |
| Serial Sevens Test | | | | |
| First 1/3 Errors | 0.47 | (0.73) | 0.20 | (0.61) |
| Second 1/3 Errors | 0.47 | (0.73) | 0.33 | (0.55) |
| Third 1/3 Errors | 0.33 | (0.55) | 0.33 | (0.61) |
| Total Errors | 1.27 | (1.28) | 0.87 | (1.67) |
| Total Test Time (in sec) | 57.20 | (32.70) | 69.47 | (34.64) |
| Stroop Color and Word Test | | | | |
| Word Page | 110.83 | (17.26) | 111.43 | (11.49) |
| Color Page | 82.53 | (13.22) | 84.33 | (10.57) |
| Color-Word Page | 47.97 | (9.03) | 51.10 | (9.23) |

Table 4, continued

Neuropsychological Test Group Means and Standard Deviations

| Variable | Depressed | | Nondepressed | | |
|------------------------------------------|----------------------------------------|-------------------------|----------------------------|-------------------------|----------------------------|
| | Mean | SD | Mean | SD | |
| Trail Making Test | | | | | |
| Part "A" Time (in sec) | 23.07 | (6.78) | 21.13 | (5.78) | |
| Part "B" Time (in sec) | 51.63 | (17.99) | 47.43 | (13.33) | |
| Rey Auditory Verbal Learning Test | | | | | |
| Total Words Recalled (T1 - T5) | 59.40 | (6.79) | 59.47 | (5.74) | |
| Total Recall Across 5 Trials | (First 1/3 Second 1/3 Third 1/3 | 21.19 18.37 19.83 | (4.48) (7.05) (6.67) | 21.44 18.37 19.70 | (4.61) (7.05) (6.10) |

| | T1 | T2 | T3 | T4 | T5 |
|---------------------------|-------------------------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|
| First 1/3 | D = 3.43 (0.97) ND = 3.17 (0.95) | D = 4.20 (0.76) ND = 4.10 (0.80) | D = 4.40 (0.81) ND = 4.60 (0.62) | D = 4.43 (0.82) ND = 4.70 (0.53) | D = 4.73 (0.52) ND = 4.87 (0.43) |
| Second 1/3 | D = 1.97 (1.27) ND = 1.50 (0.78) | D = 3.40 (1.19) ND = 3.63 (1.00) | D = 4.10 (0.96) ND = 3.97 (0.96) | D = 4.40 (0.89) ND = 4.50 (0.73) | D = 4.50 (0.94) ND = 4.77 (0.43) |
| Third 1/3 | D = 2.03 (1.19) ND = 2.63 (1.19) | D = 3.93 (1.11) ND = 3.57 (1.07) | D = 4.37 (0.76) ND = 4.20 (0.87) | D = 4.67 (0.66) ND = 4.50 (0.97) | D = 4.83 (0.38) ND = 4.80 (0.48) |
| Total (Trial Means) | D = 7.43 (3.99) ND = 7.27 (3.60) | D = 11.53 (3.24) ND = 11.30 (2.95) | D = 12.87 (2.55) ND = 12.77 (2.60) | D = 13.50 (2.40) ND = 13.70 (2.30) | D = 14.07 (1.99) ND = 14.43 (1.34) |

Table 5. Summary of the MANOVA Results for the
Neuropsychological Measures Purported to be
Sensitive to Left Anterior Cerebrum
Functioning

TABLE 5

Summary of the MANOVA Results for the Neuropsychological
Measures Purported to be Sensitive to
Left Anterior Cerebrum Functioning

| Source | df | SS | MS | F | p |
|----------------------------------------------|--------|-----------|-----------|------|--------|
| Hypothesis of an Overall Group Effect | | | | | |
| Hotelling-Lawley Trace | (9,50) | | | 2.61 | <.0150 |
| Digit Span Test (WAIS-R) | | | | | |
| Scaled Scores Group | (1,58) | 2.8167 | 2.8167 | 0.44 | <.5121 |
| Dynamometer | | | | | |
| Full Grip Strength RH Group | (1,58) | 3.2667 | 3.2667 | 0.14 | <.7079 |
| Percent Change Scores RH Group | (1,58) | 27.7440 | 27.7440 | 0.10 | <.7587 |
| Fatigue Scores RH Group | (1,58) | 22.8167 | 22.8167 | 7.78 | <.0071 |
| FAS Verbal Fluency Test | | | | | |
| Total words generated Group | (1,58) | 66.1500 | 66.1500 | 1.05 | <.3102 |
| Serial Sevens Test | | | | | |
| Total Errors Group | (1,58) | 2.4000 | 2.4000 | 1.59 | <.2118 |
| Total Time (in sec) Group | (1,58) | 2257.0667 | 2257.0667 | 1.99 | <.1639 |
| Stroop Color and Word Test | | | | | |
| Total Color-Words Named Group | (1,58) | 147.2667 | 147.2667 | 1.77 | <.1890 |

Table 5, continued

| Source | df | SS | MS | F | p |
|----------------------------------------|--------|----------|----------|------|--------|
| Trail Making Test | | | | | |
| Part B Total Time (in sec) Group | (1,58) | 260.4167 | 260.4167 | 1.04 | <.3127 |

For this MANOVA, there was an overall effect of group (Hotellings $F(9,50) = 2.61, p < .0150$). The only significant univariate ANOVA result was the main effect of group for the right-hand grip strength fatigue scores, $F(1,58) = 7.78, p < .0071$ on the dynamometer. Specifically, depressed women displayed significantly less right-handed grip strength fatigue after five trials as compared to nondepressed women.

A second MANOVA was performed for the neuropsychological measures purported to be sensitive to the right anterior cerebrum using the Design Fluency Test free and fixed novel output scores and the left-hand full grip strength, percent change, and fatigue scores of the dynamometer as dependent variables. Table 6 provides an overview of the results of the MANOVA.

For this analysis, there was no overall effect of group (Hotellings $F(5,54) = 0.31, p < .9165$). Furthermore, none of the univariate ANOVA results for group were significant.

To increase reliability of the MANOVA findings and to examine any significant intra-test differences, independent analyses of variance (ANOVAs) were performed for each neuropsychological test and measure. A Bonferroni-corrected alpha level (Winer, 1971) ($.05/35 = .001$) was used to correct for multiple comparisons. All post hoc, pairwise comparisons of the means were made using Tukey's Studentized

Table 6. Summary of the MANOVA Results for the
Neuropsychological Measures Purported to be
Sensitive to Right Anterior Cerebrum
Functioning

TABLE 6

Summary of the MANOVA Results for the Neuropsychological
Measures Purported to be Sensitive to
Right Anterior Cerebrum Functioning

| Source | df | SS | MS | F | p |
|----------------------------------------------|--------|---------|---------|------|--------|
| Hypothesis of an Overall Group Effect | | | | | |
| Hotelling-Lawley Trace | (5,54) | | | 0.31 | <.9165 |
| Design Fluency Test | | | | | |
| Free Novel Output Group | (1,58) | .0167 | .0167 | 0.00 | <.9913 |
| Fixed Novel Output Group | (1,58) | 4.2667 | 4.2667 | 0.05 | <.8178 |
| Dynamometer | | | | | |
| Full Grip Strength LH Group | (1,58) | 29.4000 | 29.4000 | 1.35 | <.2493 |
| Percent Change Scores LH Group | (1,58) | 17.1307 | 17.1307 | 0.05 | <.8242 |
| Fatigue Scores LH Group | (1,58) | 3.2667 | 3.2667 | 0.50 | <.4844 |

Range Test. Table 7 provides an overview of the independent ANOVA results for the neuropsychological tests.

For the Design Fluency Test, a two-factor, mixed design analysis of variance (ANOVA) was performed with the fixed factor of group (depressed and nondepressed) and the repeated measures of condition (free and fixed novel output). Only the main effect of condition was significant, $F(1, 58) = 32.65$, $p < .0001$ (see Figure 1). Specifically, women tended to generate significantly more novel drawings during the free condition as compared to the fixed condition.

Using the raw scores of the Digit Span subtest of the WAIS-R, a two-factor, mixed design analysis of variance (ANOVA) was conducted with the fixed factor of group and repeated measures of condition (Digits Forward and Backwards). Only the main effect of condition was significant, $F(1, 58) = 33.75$, $p < .0001$ (see Figure 2). Specifically, women obtained significantly higher raw scores in the digits forwards condition as compared to the digits backwards condition.

An ANOVA was also performed using the scaled scores for the Digit Span subtest of the WAIS-R with the fixed factor of group. This analysis was nonsignificant.

For the hand dynamometer measures, separate analyses of variances (ANOVA) were conducted for the full hand grip

**Table 7. Summary of the Independent ANOVA Results for
the Neuropsychological Tests**

TABLE 7

Summary of the Independent ANOVA Results
for the Neuropsychological Tests

| Source | df | SS | MS | F | p |
|---------------------------------|--------|-----------|-----------|-------|---------|
| Design Fluency Test | | | | | |
| (Novel Designs Generated) | | | | | |
| Group | (1,58) | 1.8750 | 1.8750 | 0.01 | <.9206 |
| Condition | (1,58) | 1074.0083 | 1074.0083 | 32.65 | <.0001* |
| Group x Condition | (1,58) | 2.4083 | 2.4083 | 0.07 | <.7877 |
| Digit Span | | | | | |
| WAIS-R Subtest | | | | | |
| (Raw Scores) | | | | | |
| Group | (1,58) | 6.0750 | 6.0750 | 0.82 | <.3688 |
| Condition | (1,58) | 85.0083 | 85.0083 | 33.75 | <.0001* |
| Group x Trial | (1,58) | 1.4083 | 1.4083 | 0.56 | <.4576 |
| Digit Span | | | | | |
| WAIS-R Subtest | | | | | |
| (Scaled Scores) | | | | | |
| Group | (1,58) | 5.6333 | 5.6333 | 0.44 | <.5121 |
| Dynamometer | | | | | |
| (Full Grip Strength in kg) | | | | | |
| Group | (1,58) | 26.1333 | 26.1333 | 0.65 | <.4238 |
| Hand | (1,58) | 145.2000 | 145.2000 | 32.48 | <.0001* |
| Group x Hand | (1,58) | 6.5333 | 6.5333 | 1.46 | <.2316 |
| Dynamometer | | | | | |
| (Perseveration/% Change Scores) | | | | | |
| Group | (1,58) | 44.2017 | 44.2017 | 0.12 | <.7277 |
| Hand | (1,58) | 205.5915 | 205.5915 | 0.75 | <.3903 |
| Group x Hand | (1,58) | .6322 | .6322 | 0.00 | <.9619 |
| Dynamometer | | | | | |
| (Fatigue Scores in kg) | | | | | |
| Group | (1,58) | 23.4083 | 23.4083 | 5.04 | <.0285 |
| Hand | (1,58) | .6750 | .6750 | 0.14 | <.7094 |
| Group x Hand | (1,58) | 3.6750 | 3.6750 | 0.76 | <.3858 |

* = significant when using the Bonferroni-corrected alpha level
(.05/35 = .001)

TABLE 7, continued

| Source | df | SS | MS | F | p |
|------------------------------------------|---------|-------------|------------|---------|---------|
| FAS Verbal Fluency Test | | | | | |
| (words generated) | | | | | |
| Group | (1,58) | 15.6056 | 15.6056 | 0.74 | <.3944 |
| Trial | (2,116) | 281.4111 | 140.7056 | 31.14 | <.0001* |
| Group x Trial | (2,116) | 25.7444 | 12.8722 | 2.85 | <.0620 |
| Rey Auditory Verbal Learning Test | | | | | |
| (words recalled) | | | | | |
| Group | (1,58) | .0100 | .0100 | 0.00 | <.9512 |
| Trial | (4,232) | 600.7400 | 150.1850 | 410.95 | <.0001* |
| Group x Trial | (4,232) | 1.2733 | .3183 | 0.87 | <.4820 |
| Location | (2,116) | 52.2600 | 26.1300 | 23.59 | <.0001* |
| Group x Location | (2,116) | .2067 | .1033 | 0.09 | <.9110 |
| Trial x Location | (8,464) | 43.4400 | 5.4300 | 8.59 | <.0001* |
| Group x Trial x Location | (8,464) | 15.4933 | 1.9367 | 3.06 | <.0023 |
| Serial Sevens Test | | | | | |
| (number of errors) | | | | | |
| Group | (1,58) | .8000 | .8000 | 1.59 | <.2118 |
| Location | (2,116) | .1778 | .0889 | 0.25 | <.7763 |
| Group x Location | (2,116) | .5333 | .2667 | 0.76 | <.4693 |
| Stroop Color-Word Test | | | | | |
| (items named/read) | | | | | |
| Group | (1,58) | 153.0889 | 153.0889 | 0.46 | <.5006 |
| Condition | (2,116) | 114221.2000 | 57110.6000 | 1053.24 | <.0001* |
| Group x Condition | (2,116) | 48.1800 | 24.0900 | 0.44 | <.6424 |
| Trail Making Test | | | | | |
| (time in sec) | | | | | |
| Group | (1,58) | 282.1333 | 282.1333 | 1.42 | <.2385 |
| Trial | (1,58) | 22577.6330 | 22577.6330 | 246.90 | <.0001* |
| Group x Trial | (1,58) | 38.5330 | 38.5330 | 0.42 | <.5188 |

* = significant when using the Bonferroni-corrected alpha level
(.05/35 = .001)

**Figure 1. Main Effect of Condition on the Design
Fluency Test**

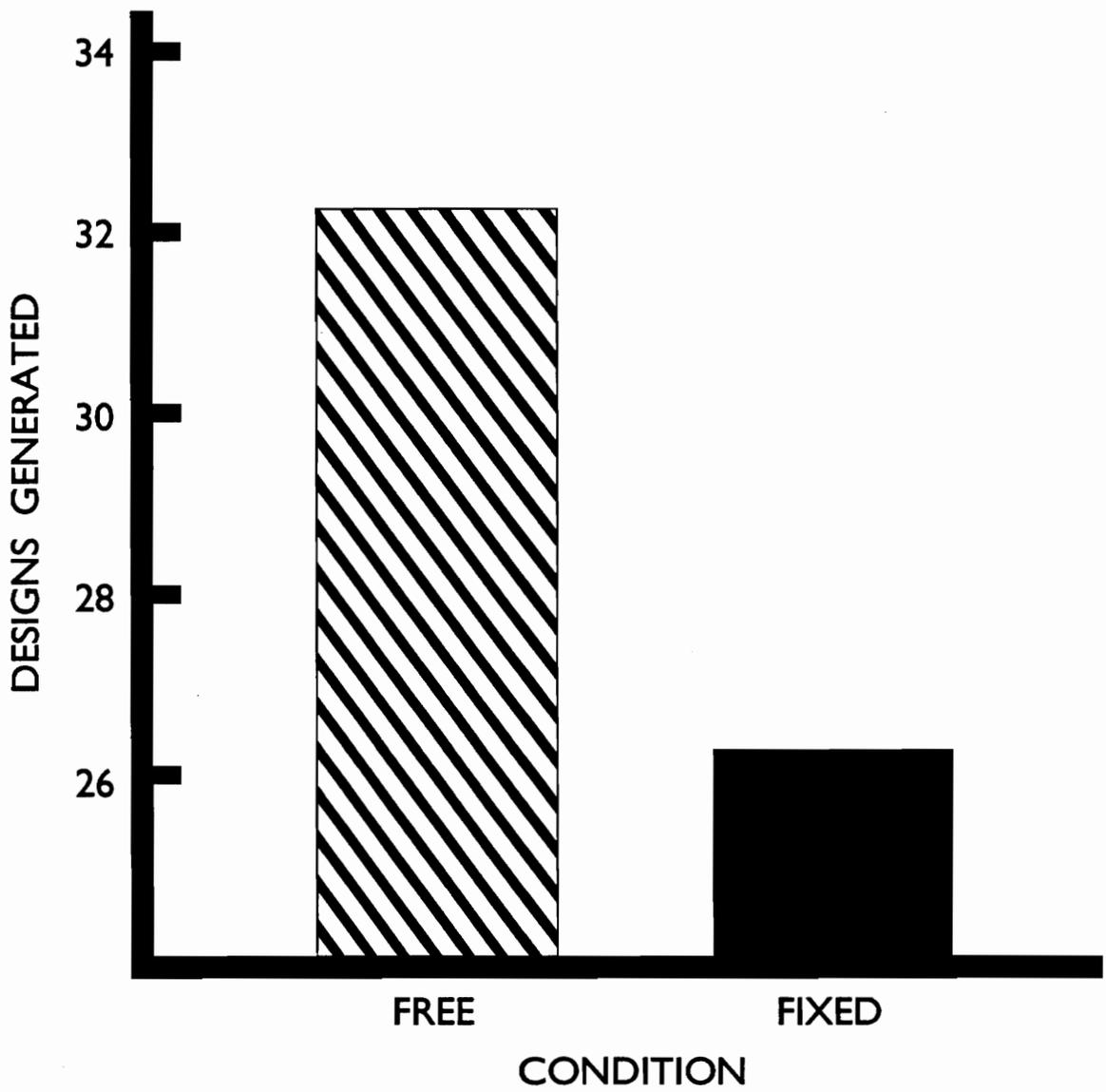


Figure 1. Main Effect of Condition on the Design Fluency Test

Figure 2. Main Effect of Condition on the Digit Span
Subtest of the WAIS-R

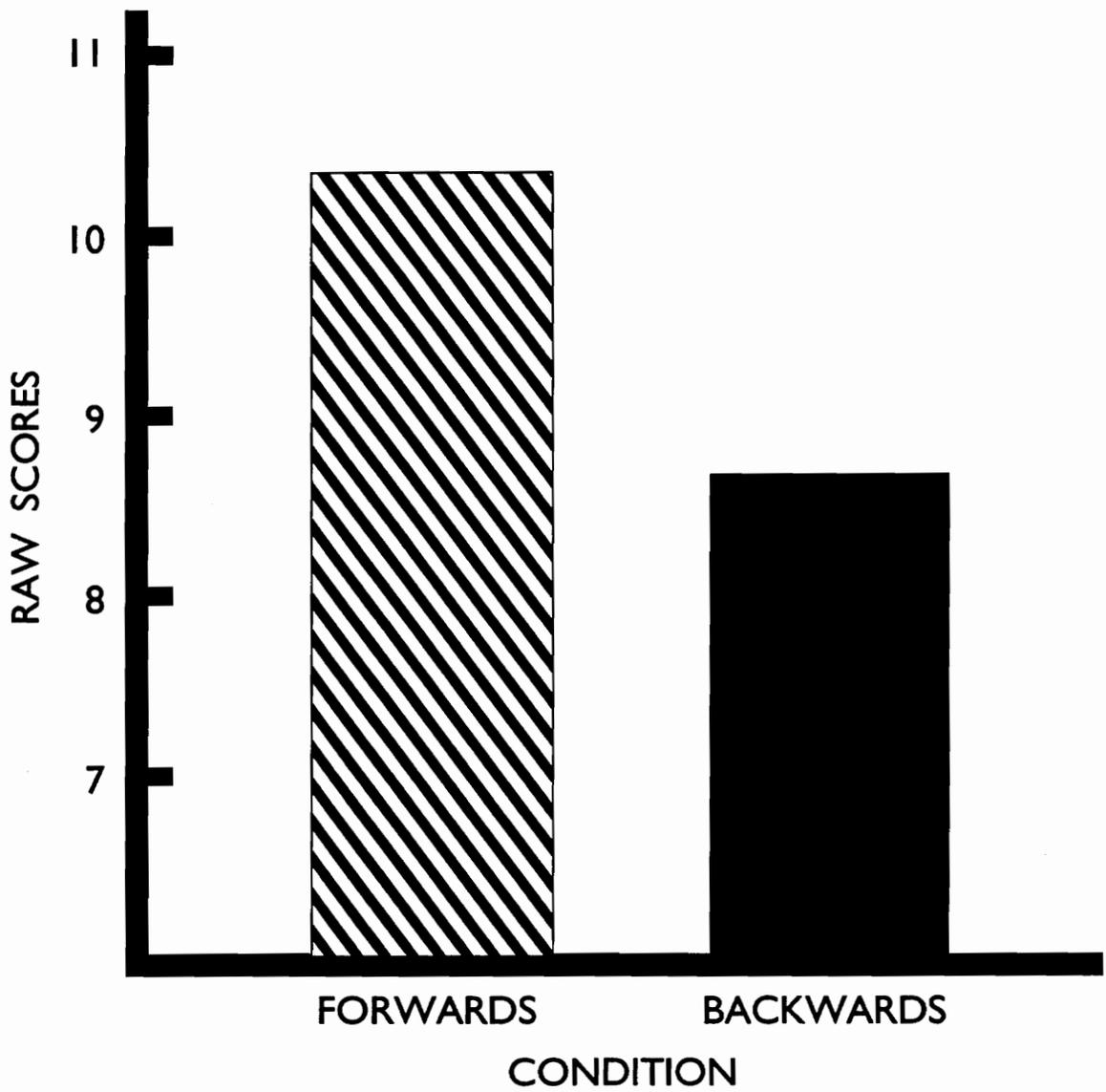


Figure 2. Main Effect of Condition on the Digit Span Subtest of the WAIS-R

strength, perseveration, and fatigue data.

For the full-hand grip strength (in kg.) data, a two-factor, mixed design analysis of variance (ANOVA) with the fixed factor of group and the repeated measures of hand (left and right) was performed. Only the main effect of hand was significant, $F(1,58) = 32.48, p < .0001$ (see Figure 3). Specifically, right-hand grip strength was significantly stronger than left-hand grip strength.

The percentage change scores (from Trial 1 to Trial 2) were used as the dependent variables in the analysis of the perseveration data via a two-factor, mixed design analysis of variance (ANOVA) with the fixed factor of group and the repeated measures of hand. Perseveration was defined as an inaccurate half grip-strength response where there was a tendency to repeat the full grip-strength response (Harrison & Pauly, 1990; Crews & Harrison, 1994b). The "percent-change" scores for each hand were generated using the following formula:

$$\% \text{ Change} = \frac{\text{Hard} - \text{Half}}{\text{Hard}} \times 100$$

If the percent-change score equaled 50, the hard to half-as-hard score was perfect (Huntzinger, 1989). A score

**Figure 3. Main Effect of Hand on the Dynamometer Hand
Grip Strength Task**

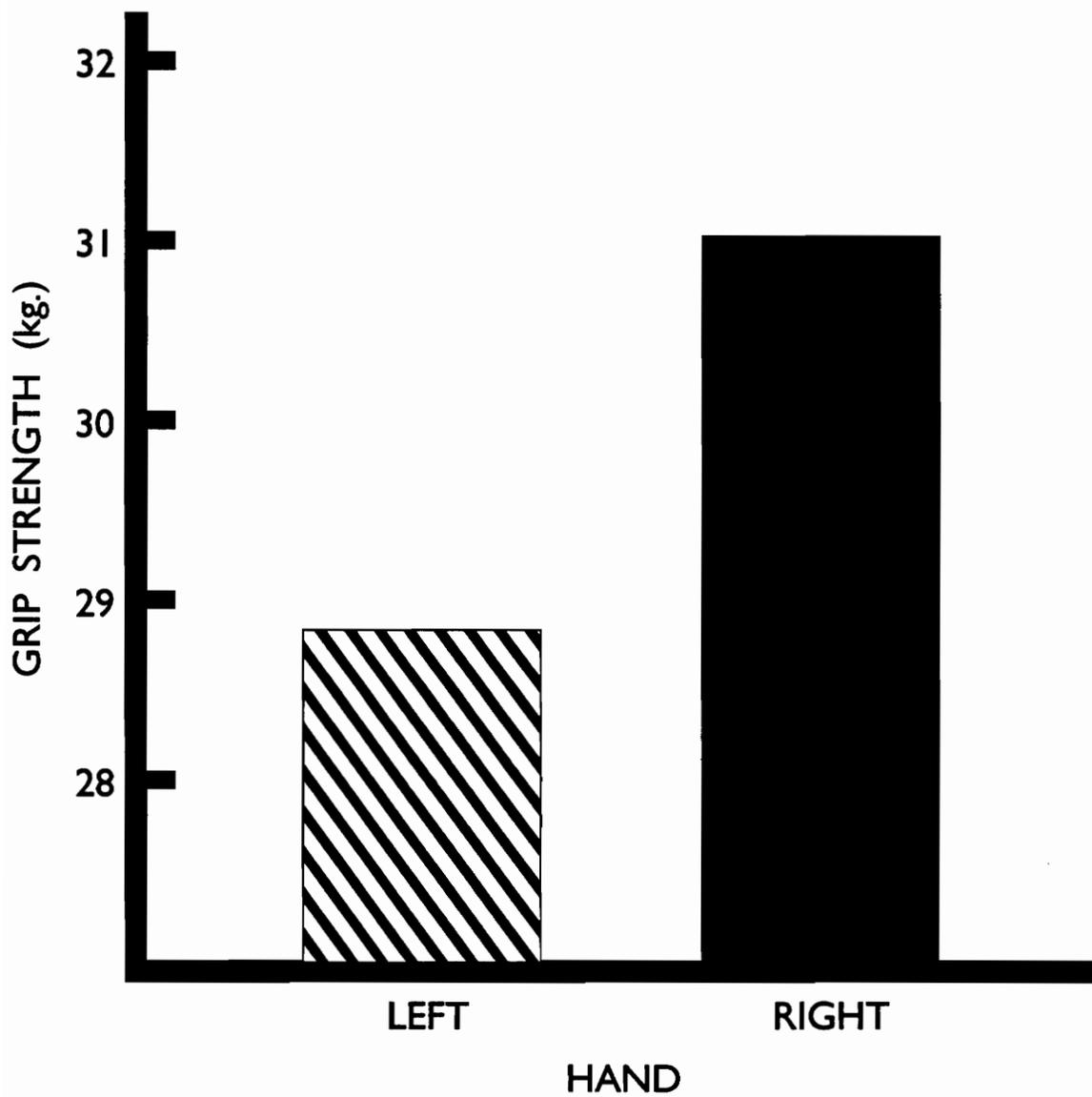


Figure 3. Main Effect of Hand on the Dynamometer Hand Grip Strength Task

less than 50 reflected an inaccurate, perseveration response with greater perseveration denoted by lower scores (Huntzinger, 1989). For this data, no significant interactions or main effects were found.

Fatigue was defined as the amount (in kg.) of decrease in grip-strength seen over five consecutive trials. Thus, the score from the fifth trial was subtracted from the score on the first trial to obtain a fatigue score. For this data, a two-factor, mixed design analysis of variance (ANOVA) with the fixed factor of group and with repeated measures of hand (left and right) was performed. When the Bonferroni-corrected alpha level (i.e., $p < .001$) was used, none of the fatigue score analyses were significant.

For the FAS Verbal Fluency Test, a two-factor, mixed design analysis of variance (ANOVA) was performed with the fixed factor of group and repeated measures of trial (the letters: F, A, and S), using the number of words generated as the dependent variable. Only the main effect of trial was significant, $F(2,116) = 31.14$, $p < .0001$ (see Figure 4). Specifically, women generated significantly more words that began with the letter S than for the letters F or A. They also generated significantly more words that began with the letter F than for the letter A.

For the Rey Auditory Verbal Learning Test, a three-factor, mixed design analysis of variance (ANOVA) was

Figure 4. Main Effect of Trial on the FAS Verbal
Fluency Test

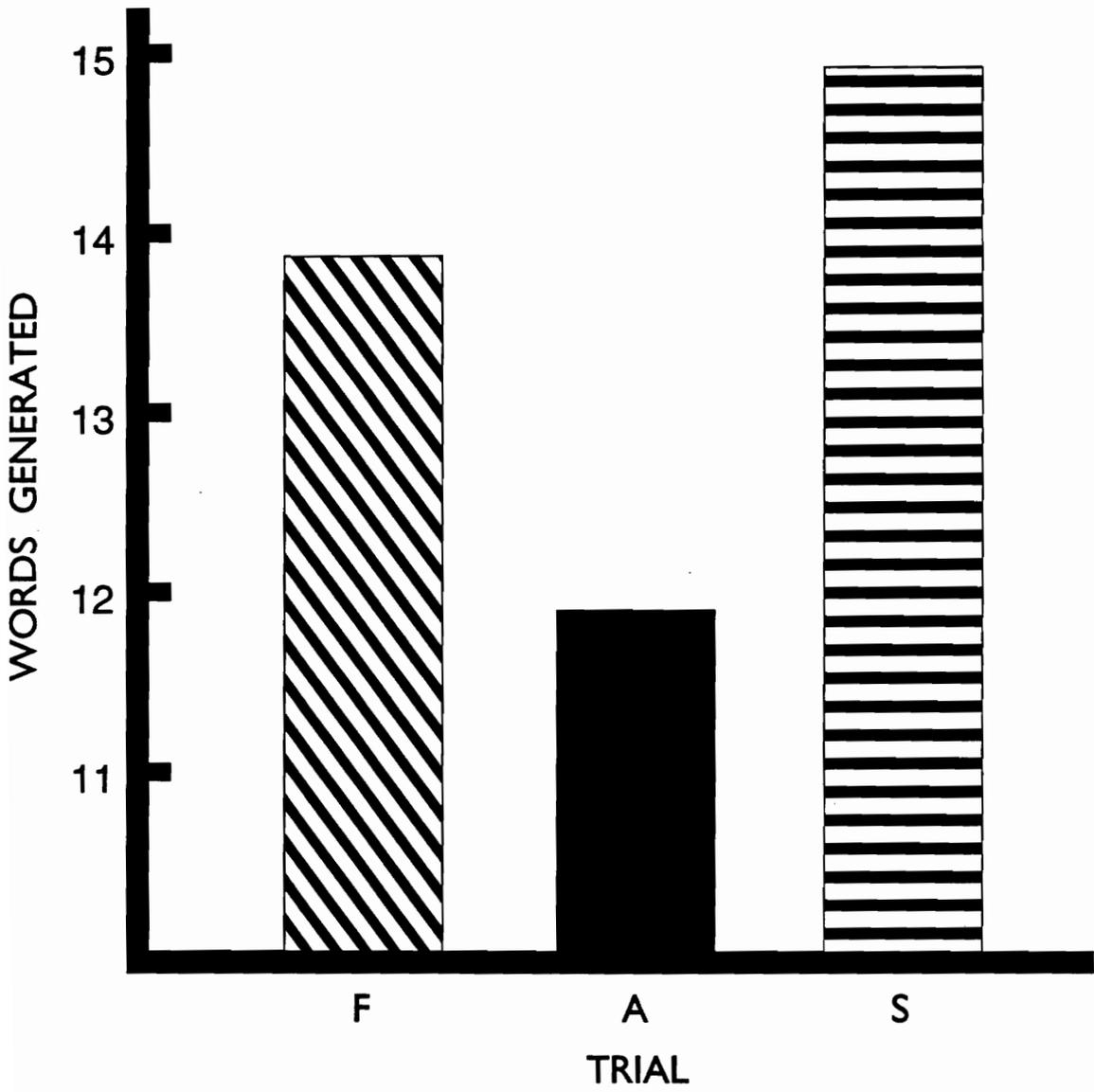


Figure 4. Main Effect of Trial on the FAS Verbal Fluency Test

performed, using the dependent measure of total words recalled, with the fixed factor of group and the repeated measures of trial (Trials 1 - 5) and location (first five words, second five words, third five words of the 15-item word list). The trial x location interaction was significant, $F(8,464) = 8.59, p < .0001$ (see Figure 5). Specifically, post hoc analyses revealed that women's recall differed significantly on Trial 1 across all three presentation locations. Significantly more words were recalled on Trial 1 that had been presented during the first location of the word list as compared to the second or third location of Trial 1. More words were also recalled from the third location of the word list as compared to the second location of Trial 1. On Trial 2, women recalled reliably more words from the first location of the word list as compared to the second location of the list. There were no significant differences between locations on Trials 3, 4, or 5.

Women recalled significantly fewer words that had been presented to them during the first location of Trial 1 as compared to the first location of Trials 2, 3, 4, and 5. Recall of the second location of Trial 1 was reliably poorer than that of the second location of Trials 2, 3, 4, and 5. Recall of the third location of Trial 1 also differed significantly (fewer words) from the third location of

Figure 5. Trial by Location Interaction for the
Rey Auditory Verbal Learning Test

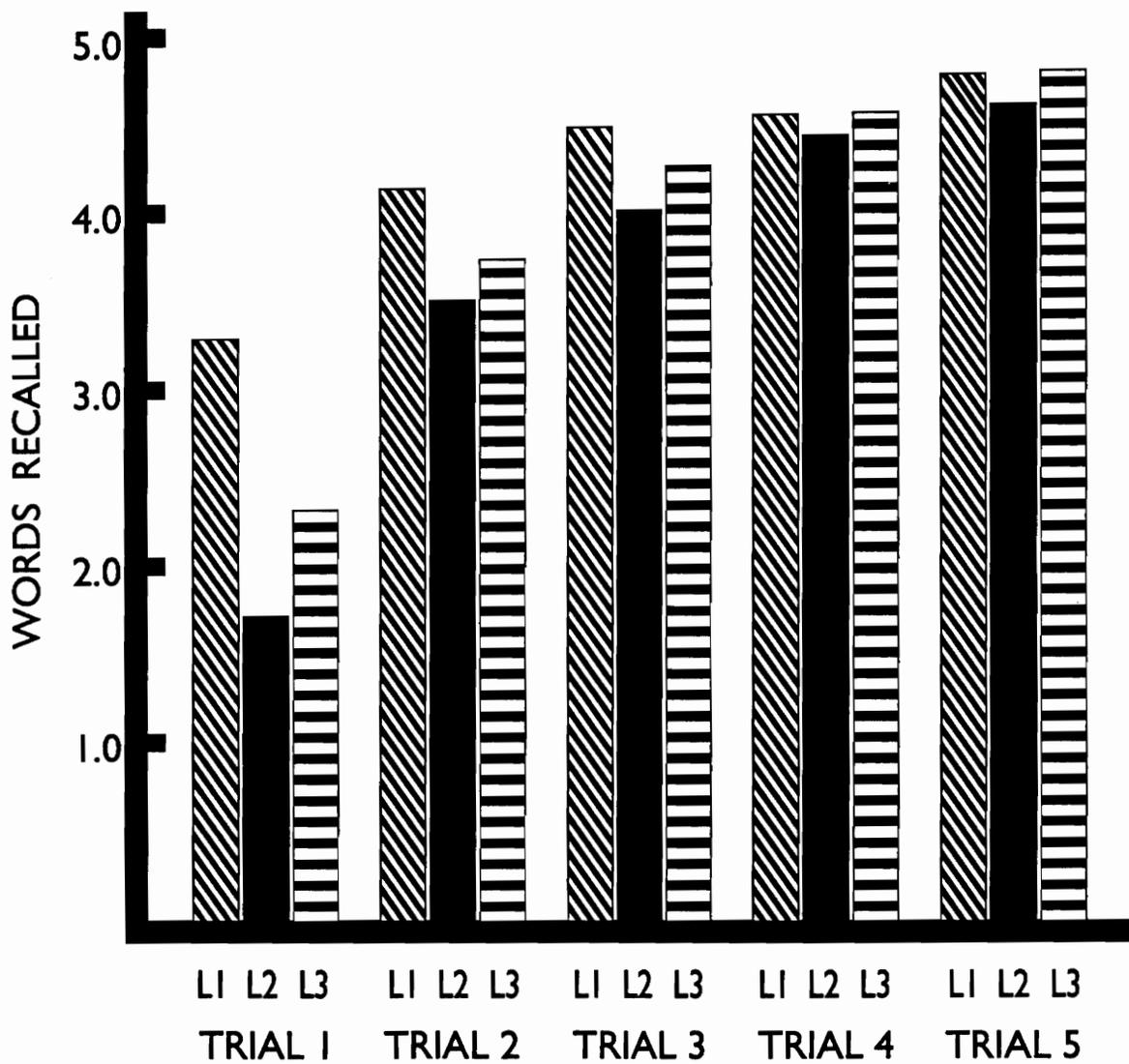


Figure 5. Trial by Location Interaction for the Rey Auditory Verbal Learning Test

Trials 2, 3, 4, and 5. Women's recall of the first location of Trial 2 was reliably poorer than their recall on the first location of Trial 5. Significantly fewer words were recalled that had been presented during the second location of Trial 2 as compared to the second location of Trials 3, 4, and 5. Women also recalled significantly fewer words presented during the third location of Trial 2 as compared to the third segment of Trials 3, 4, and 5. Regarding the second location of Trial 3, women recalled reliably fewer words as compared to the similar segment of Trial 5. Women also recalled significantly fewer words presented during the third location of Trial 3 as compared to the third location of Trial 5. In summary, acquisition across trials occurred at a faster rate for location one (primacy effect), followed by location three (i.e., recency effect), followed, finally, by acquisition of the middle of the word list.

The main effect of location on the RAVLT was significant, $F(2,116) = 23.59, p < .0001$ (see Figure 6). Women recalled significantly more of the words presented during the first location of the list as compared to the second and third locations of the word list. Recall of the third location of the list was also significantly greater than women's recall of the second location of the list. The main effect of trial was also significant, $F(4,232) = 410.95, p < .0001$ (see Figure 7). Specifically, post hoc

Figure 6. Main Effect of Location on the Rey Auditory
Verbal Learning Test

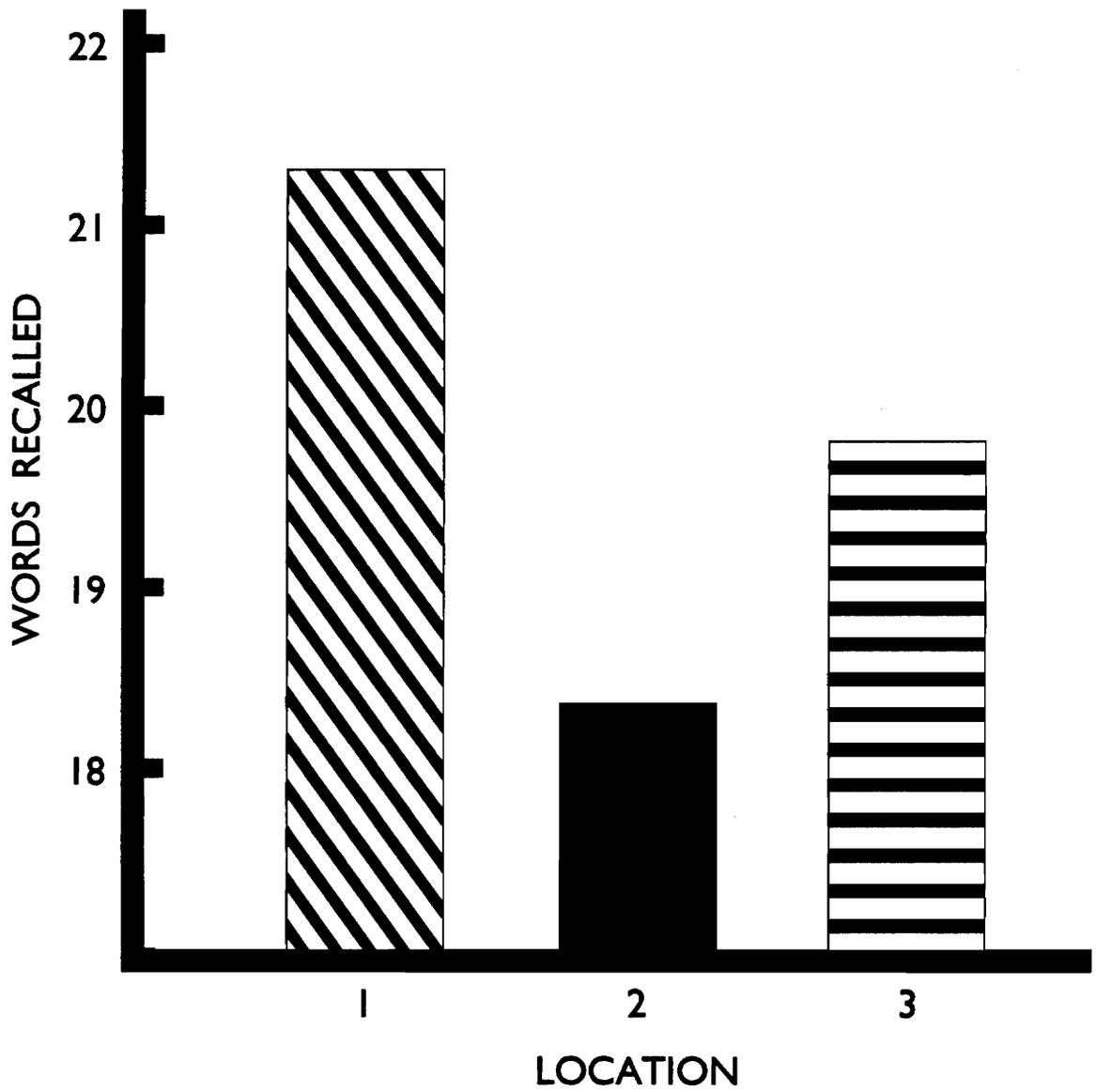


Figure 6. Main Effect of Location on the Rey Auditory Verbal Learning Test

Figure 7. Main Effect of Trial on the Rey Auditory
Verbal Learning Test

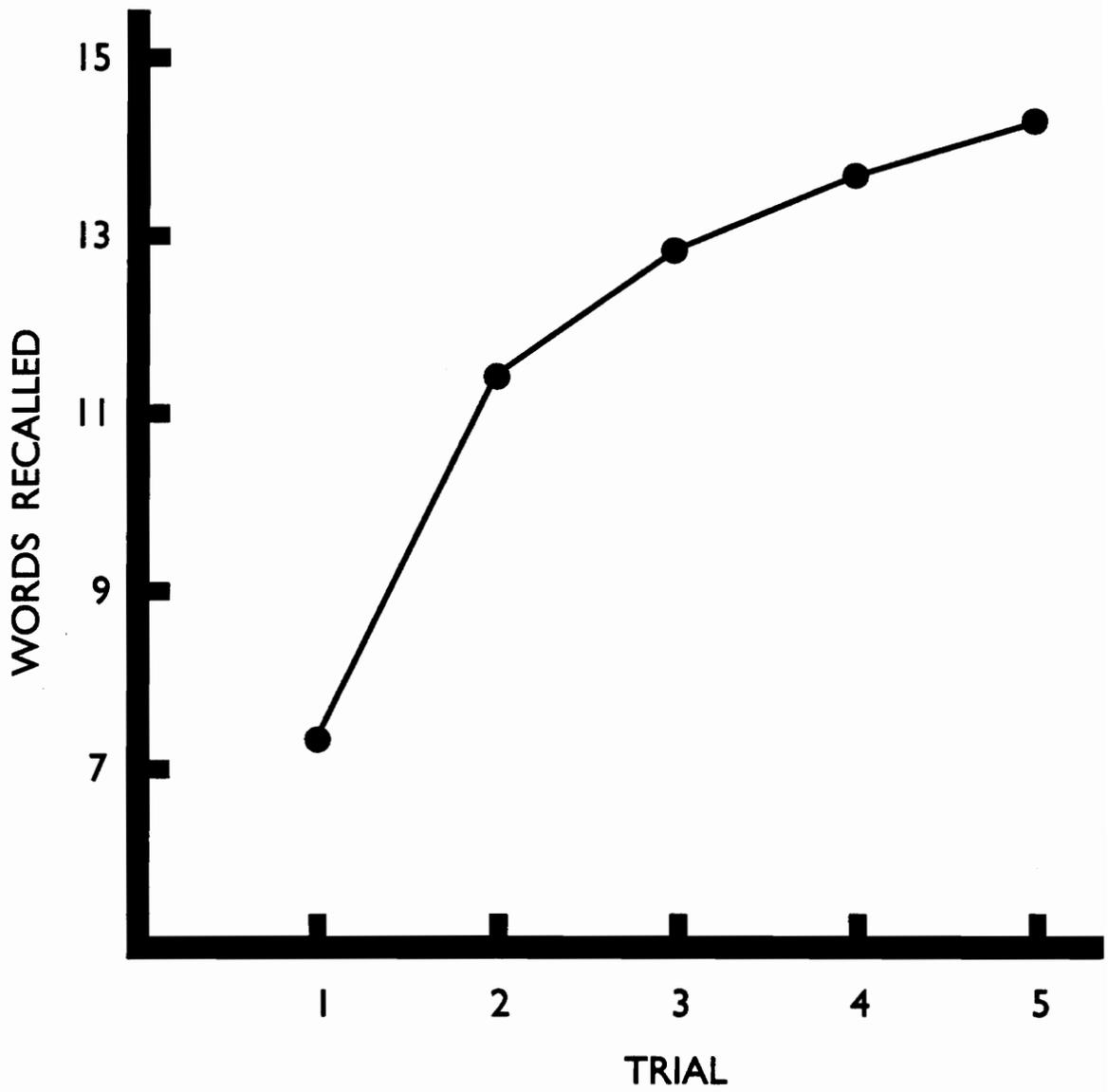


Figure 7. Main Effect of Trial on the Rey Auditory Verbal Learning Test

analyses revealed significant, incremental, increases in the number of words recalled on each trial, from Trial 1 to Trial 5.

For the Serial Sevens Test, a two-factor, mixed design analysis of variance (ANOVA) was performed with the fixed factor of group and the repeated measures of location (first one-third, second one-third, third one-third of subtractions), using total errors as the dependent variable. None of the Serial Sevens Test analyses were significant.

For the Stroop Color and Word Test, a two-factor, mixed design analysis of variance (ANOVA) was conducted with the fixed factor of group and the repeated measures of condition (words, colors, color-words) using the total number of items correctly named as the dependent variable. Only the main effect of condition was significant, $F(2,116) = 1053.24$, $p < .0001$ (see Figure 8). Specifically, post hoc analyses revealed that women named/read significantly more words as compared to colors or color-words. They also named significantly more colors as compared to color-words.

For the Trail Making Test, a two-factor, mixed design analysis of variance (ANOVA) was performed with the fixed factor of group and the repeated measures of trial (Parts A and B) using total task time as the dependent variable. Only the main effect of trial was significant, $F(1,58) = 246.90$, $p < .0001$ (see Figure 9). Specifically, women

Figure 8. Main Effect of Condition on the Stroop Color
and Word Test

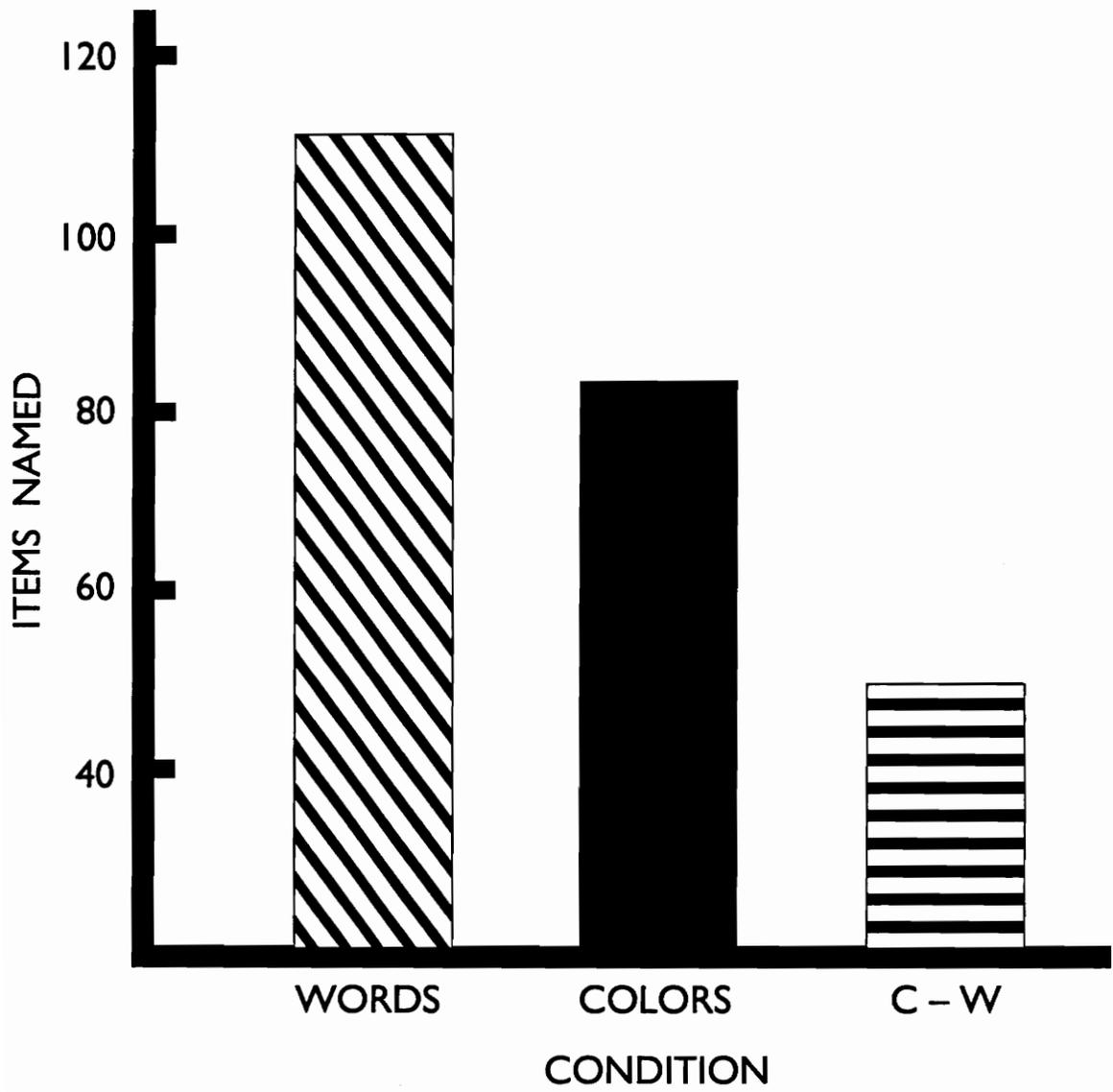


Figure 8. Main Effect of Condition on the Stroop Color and Word Test

Figure 9. Main Effect of Trial on the Trail Making Test

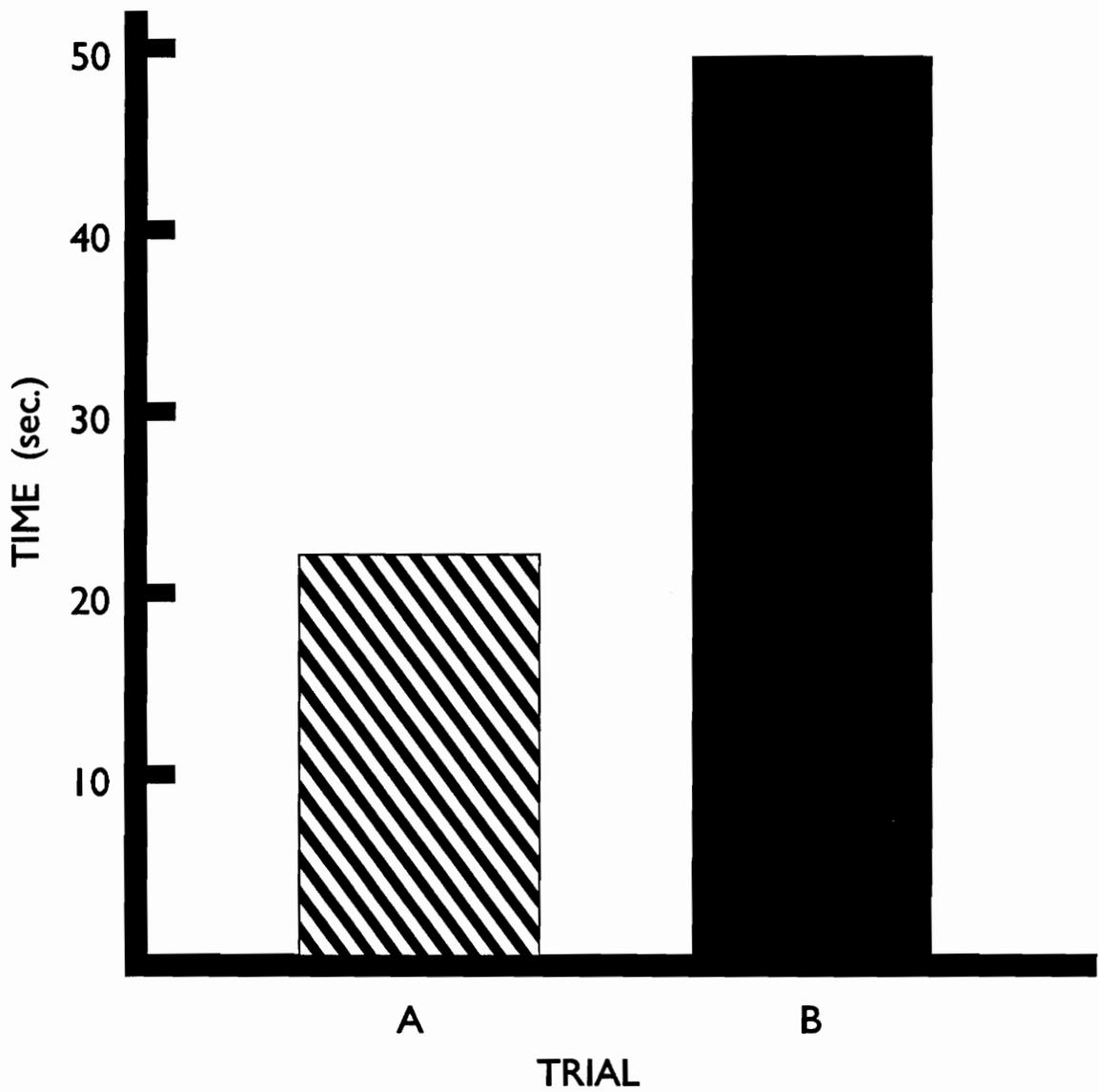


Figure 9. Main Effect of Trial on the Trail Making Test

completed Part A of this task significantly quicker than Part B.

Discussion

This research compared a group of young, unmedicated, outpatient women who were moderately depressed (according to self-report inventories and clinical interviews) to a group of nondepressed women who were closely matched for age, handedness, educational and intellectual levels on a series of neuropsychological measures. The depressed group, as opposed to the nondepressed group, were also characterized by elevated levels of state and trait anxiety.

For the neuropsychological tests, a significant main effect of group was found for the right-handed grip strength fatigue scores on the dynamometer. Specifically, depressed women exhibited significantly less hand grip fatigue at the right hand after five trials, as compared to nondepressed women. This finding possibly represents a type of motor perseveration in depressives, as compared to controls, where there is a greater tendency to repeat/maintain (over trials) the initial full grip strength response. Such perseveration at the right hand would likely be indicative of mild left anterior cerebrum dysfunction/deactivation.

Alternatively, this finding of less right-handed motor fatigue in depressives may be linked to these women's

elevated levels of anxiety. Specifically, heightened autonomic nervous system arousal, which has been associated with improved task performances up to an optimal level, may likely be interpreted as anxiety (Duffy, 1962; Easterbrook, 1959; Hebb, 1955; & Lindsley, 1951). This arousal/anxiety, in turn, may have differentially impacted the depressives' left anterior regions and allowed them to exhibit less hand grip fatigue at the right hand after five trials.

While the underlying cause(s) of this fatigue score finding remains speculative, it should be noted that this result is in contrast to research recently completed in our laboratory (Crews, Harrison, Rhodes, & Demaree, 1995) where women with depressed mood displayed significantly less motor fatigue at the left hand as compared to controls. Further, there were no significant fatigue score differences between the groups at the right hand. Hence, these conflicting findings suggest that hand grip strength fatigue may not be a reliable behavioral indicator of anterior cerebrum functioning in depressed women.

Despite a priori hypotheses, the present research failed to identify any other significant differences between depressed and nondepressed women on any of the neuropsychological tests purported to be sensitive to executive-controlled functioning and, in particular, the left anterior cerebrum. These results are supported by

previous studies which have also failed to find significant neuropsychological impairments in samples of depressives on such measures as Digit Spans (Gass & Russell, 1986; Gray et al., 1987), dynamometer measures of hand grip strength (Cohen et al., 1982; Rosofsky, Levin, & Holzman, 1982), verbal fluency tests (Johnson & Crockett, 1982; Wolfe et al., 1987), verbal memory tests (Gass & Russell, 1986; Williams, Little, Scates, & Blockman, 1987), the Stroop Test (Rush et al., 1983), the Trail Making Test (Rush et al., 1983), card sorting tests (Hart et al., 1987; Loeb, Beck, Diggory, 1971), and the Category Test (Gray et al., 1987), as well as on the entire Luria-Nebraska Neuropsychological Battery (Miller, Faustman, Moses, & Csernansky, 1991).

Alternatively, the present findings are in contrast to other research with depressives, which has indicated hypoactivation/dysfunction of the left anterior cerebrum (relative to the right anterior region) and impaired performances on neuropsychological tests (see previous literature review). It should be noted, however, that many of these test performance studies have been criticized for their failures to adequately identify their samples, use rigorous methodology (e.g., adequate control groups, sufficient sample sizes), as well as the inclusion of subjects of diverse ages, genders, and depressive subtypes (Cassens et al., 1990; McAllister, 1981; Miller, 1975;

Miller et al., 1991; Sweet, Newman, & Bell, 1992).

Furthermore, the overwhelming majority of studies which have utilized neuropsychological tests have involved hospitalized (i.e., inpatients) and/or medicated, depressed patients. Thus, the findings from these studies are not directly comparable to the current results.

Although the neuropsychological measures utilized in this study may be of some value in differentiating certain groups of depressives (e.g., inpatients, psychotropically medicated, severely depressed) from nondepressives, the present study's findings suggest that these measures may be relatively insensitive in differentiating other groups of depressives from nondepressives and argue against the frequently held stereotype that depressed individuals typically display impaired performances on neurocognitive tasks (Hartlage, Alloy, Vazquez, & Dykman, 1993; McAllister, 1981; Miller, 1975; Newman & Sweet, 1992; Sweet, Newman, & Bell, 1992). These findings also lend little/no behavioral support to previous EEG and neuroimaging studies (see previous literature review) which have found evidence of hemispheric asymmetries (i.e., left frontal hypoactivation) over the anterior regions in depressives. It should be noted, however, that it remains unknown if such asymmetries were actually present in this sample of depressives and the neuropsychological tests were generally not of sufficient

sensitivity to detect any resulting cerebral dysfunction. Alternatively, it may have been that no significant hemispheric asymmetries were present in these depressives which, in turn, were reflected by their unimpaired neuropsychological test performances. Based on the present study's results, it appears imperative to precisely identify the profiles of depressives who are likely/unlikely to exhibit deficits in cognitive and behavioral functioning.

The typical profile of the depressed subjects used in the present study appears to differ significantly from depressed patients employed in previous studies who have demonstrated impaired neuropsychological performances (see Cassens et al., 1990; McAllister, 1981; Miller, 1975; Miller et al., 1991; Sweet et al., 1992 for reviews). One of the primary ways depressed subjects in this study differed from the majority of past neuropsychological test performance studies was the utilization of outpatient depressives versus hospitalized, depressed inpatients. Jarvis and Barth (1994) have noted that, in general, hospitalized patients tend to perform poorer on neurocognitive measures regardless of the reasons for hospitalization. Furthermore, while all the depressives in this study met ADIS-R (DiNardo & Barlow, 1988a) and DSM-IV (American Psychiatric Association, 1994) criteria for major depression, they were typically only moderately depressed.

This is in contrast to assessment studies which have examined severely depressed patients (e.g., Abrams et al., 1987; Cornell et al., 1984; Frith et al., 1983; Shipley et al., 1981; see also Harltage et al., 1993, and Miller, 1975, for reviews), and numerous other studies where inpatients were used, but depression severity was not mentioned (see Cassens et al., 1990; Harltage et al., 1993; McAllister, 1981, for reviews). The fact that the depressed subjects in these other studies were in need of inpatient treatment suggests that they were likely more severely depressed than the outpatient depressives examined in the present study. In contrast to reports which have suggested a positive association between depression severity and neuropsychological test impairment (see Miller, 1975; Newman & Sweet, 1992 for reviews), the depressions of the women in the present study may not have been of sufficient severity to result in significant neurocognitive deficits.

Relatedly, all of the outpatient subjects in this study were volunteers who responded to therapist inquiries, flyers, advertisements, and radio announcements regarding this project. This volunteerism in and of itself indicated a certain level of functioning, motivation/interest (e.g., to participate), as well as possibly help-seeking behaviors. Clinically, it also appeared that the women were interested in the assessment process and put forth good effort. In

contrast to reports which have attributed depressives' cognitive impairments to decreased/deficient motivation (Cohen et al., 1982; McAllister, 1981; Miller, 1975), it may have been that the level of motivation exhibited by the depressed sample in this study helped to offset any neuropsychological impairments which may have otherwise been observed. Hence, the fact that the depressed women were volunteer outpatients who were only moderately depressed and who displayed motivation/interest in participating in this research may have contributed to their unimpaired performances on the neuropsychological measures.

Another major way in which the depressed subjects in the present study differed from those in other assessment-type studies was that they were currently not receiving any psychotropic medications. This is in contrast to many past studies (see Cassens et al., 1990) which have utilized depressed subjects who were being treated with psychotropic medications (i.e., antidepressants). Such studies make it difficult to separate the effects of the medications from that of depression on neuropsychological test performances and preclude comparison of these studies with the present study.

In contrast to all of the neuropsychological test performance studies cited within the introduction, which utilized both men and women as subjects, the present study

focused exclusively on women. As the cognitive functions of women have been suggested by some to be less lateralized (as compared to men) (Bryden, 1982; Kolb & Whishaw, 1990), it may follow that their executive functions may, likewise, be more bilaterally controlled than those of men. Thus, even based on the premise that the depressed women's left anterior regions were hypoactivated (relative to their right anterior regions), as suggested by previous research (see introduction for a review), their right frontal regions may have been able to compensate for any left frontal lobe dysfunction, as a result of bilateral representation of function, and allowed these women to maintain adequate performances on the tests of executive functioning.

The fact that the depressed women in this study were relatively well educated ($M = 14.37$ years) and intellectually bright, as denoted by their estimated high average verbal (i.e., WAIS-R Vocabulary subtest scores) and performance (i.e., WAIS-R Block Design subtest scores) intellectual abilities, may have also played a role in nullifying any effects that depression may have had on the women's neuropsychological test performances. This is supported by data which have documented that intellectual and education levels are positively associated with, and may influence performance on, neuropsychological tests (Borstein, 1986; Geffen, Hoar, O'Hanlon, Clark, & Geffen,

1990; Heaton, Grant, & Matthews, 1991; Warner, Ernst, Townes, Peel, & Preston, 1987; Wiens, McMinn, & Crossen, 1988; see also Jarvis & Barth, 1994). Thus, as the depressed women may have been less lateralized, were relatively well educated, and intellectually bright, these factors may have helped them to compensate for any left anterior cerebrum dysfunction that may have been present and essentially rendered the neuropsychological measures insensitive in detecting executive function deficits in these depressed women.

A relatively homogeneous group of young (mean age = 20.33 years), depressed women was also examined in this study in contrast to the studies cited within the introduction. In the large majority of these past studies, the samples consisted of subjects of diverse ages and in only two studies (Beatty et al., 1990; Fisher et al., 1986) were the mean ages of the depressed subjects less than 30 years (i.e., $M = 29.2$ years and $M = 28.5$ years respectively). The findings from these studies are not directly comparable to the present results due to the heterogeneity of ages and utilization of older samples in these past studies. Relatedly, since the depressed women in the present study were relatively young, they typically did not have extensive histories of multiple/recurrent depressions. Thus, it seems reasonable that these

depressives may not have suffered from depression long enough (or suffered enough recurrent episodes) to negatively impact their cognitive functioning or to exhibit the significant impairments in functioning or residual symptoms that are often seen in individuals with extensive histories of affective disorders (American Psychiatric Association, 1994).

As noted above, the depressed group, compared to nondepressed women, also scored significantly higher on both the state and trait anxiety scales of the State-Trait Anxiety Inventory (Spielberger, 1983). The depressed group's state and trait raw score means placed them at the 82nd and 97th percentiles, respectively, while nondepressed women obtained state and trait score means at the 20th and 17th percentiles. Hence, the depressed women, as opposed to the nondepressed group, reported elevated levels of temporary, situational, state anxiety as well as high levels of relatively stable, long-lasting, anxiety proneness (trait anxiety) (Spielberger, 1983). Relatedly, there were also significant positive correlations between their BDI scores and both their STAI state and trait anxiety scores. These findings were not unexpected as elevated levels of anxiety are often an associated feature of depression according to the DSM-IV (American Psychiatric Association, 1994) and also paralleled previous empirical findings (Crews & Harrison,

1994a; Crews & Harrison, 1994c). Furthermore, sympathetic autonomic nervous system (ANS) arousal, which produces symptoms such as increased heart and respiratory rates, muscle tension, and diaphoresis (Duffy, 1962; Lindsley, 1951) may likely be interpreted as anxiety and result in heightened, self-reported anxiety. According to arousal theory, such increases in arousal may be associated with improved task performances up to an optimal level at which point further increases in arousal may impair behavioral performances (Duffy, 1962; Easterbrook, 1959; Hebb, 1955; Lindsley, 1951). Although it remains unknown as to how heightened anxiety may have affected depressed women's neuropsychological test performances, based on arousal theory, it may have helped to offset any left anterior cerebrum hypoactivation or dysfunction and, in turn, enabled these women to perform better on the measures than they might have if their anxiety levels were low.

In summary, there appears to be a number of significant differences between the typical profiles of the depressed subjects utilized in the present study and the samples of depressives examined in previous studies. Although possible reasons were presented as to how the various factors may have impacted the depressives' neuropsychological test performances, it should be noted that it remains unknown at present which, if any, of these variables are actually

responsible for the current findings. In all likelihood, however, a number of these factors may have interacted synergistically to produce the study's findings.

There were a number of significant findings from the neuropsychological tests which were not unexpected and that corresponded to the results of previous research. The only significant interaction observed was the trial by location interaction for the Rey Auditory Verbal Learning Test. Specifically, primacy and recency free recall effects were observed across both Trial 1 and Trial 2. These findings are consistent with past research (Crockett, Hadjistavropoulos, & Hurwitz, 1992) which has demonstrated both primacy and recency effects on the RAVLT and suggests that memory for items in the first and last one-third of the word lists tend to be better than for items occurring during the middle one-third of the list. Women also tended to recall significantly fewer words at each location (first, second, and third one-thirds of the word list) during the earlier trials as compared to later trials, especially Trials 4 and 5. These findings support previous research (Crockett et al., 1992) and indicate improved free recall and increased learning (i.e., a learning curve) over repeated presentations of the list. Relatedly, the main effect of location was significant which indicated that women exhibited a primacy effect for words occurring during

the first one-third of the word list as compared to the middle and last one-thirds of the list. Women also exhibited a recency effect for the last one-third of the list as compared to the middle one-third of the list. These findings also support past research which has found both primacy and recency effects on the RAVLT (Crockett et al., 1992; Glanzer & Cunitz, 1966; see Lezak, 1983). The main effect of trial was also significant and revealed incremental increases in the number of words recalled over each trial (Trial 1 to Trial 5). This finding supports past research (Geffen, Hoar, O'Hanlon, Clark, & Geffen, 1990; Wiens, McMinn, & Crossen, 1988) and indicates improved free recall as well as increased learning over repeated word list administrations.

For the Design Fluency Test, women generated significantly more designs in the free condition as compared to the fixed condition. This was not surprising in light of the tests' standardized instructions (Jones-Gotman, & Milner, 1977) which allow subjects five minutes to generate drawings in the free condition as compared to only four minutes in the fixed condition. Furthermore, unlike the free condition in which subjects may generate any novel drawing they wish, in the fixed condition, additional constraints are added which require subjects to produce novel designs that consist of only four lines. Hence, it is

likely that the increased time limit as well as the less restrictive nature of the task allowed women to generate more designs in the free as compared to the fixed condition.

On the WAIS-R Digit Span subtest, women obtained significantly higher raw scores on the digits forward as compared to the digits backwards condition. This finding parallels previous research (Black & Strub, 1978; Costa, 1975) indicating that individuals tend to recite more digits forwards as compared to digits backwards as it is hypothesized that digits forwards is less demanding on attentional, concentration, and memory processes (Lezak, 1983).

For the dynamometer task of full grip strength, women's right-hand grip strength was significantly stronger than their left-hand grip strength. Since all women in the study had been identified via self-report as right-hand dominant, based on the correlation between such measures and hand proficiency tests (Bryden, 1982; Coren et al., 1979;), the results were not unexpected. These findings also replicated results of previous dynamometer studies (Crews & Harrison, 1994b; Dodrill, 1978a; Harrison & Pauly, 1990) and may reflect superior left hemisphere motor ability in these women and the result of daily use/practice with the right hand (Bryden, 1982).

On the FAS Verbal Fluency Test, the women generated

significantly more words that began with the S in one minute as compared to the letters F or A. They also generated more words that began with the letter F than for the letter A. These findings are consistent with previous studies (Borkowski et al., 1967; Cauthen, 1978) and suggest that the letter S was the easiest from which to elicit word associations, followed by the letter F and A respectively. Borkowski et al., 1967, have also noted that the mean number of word associations for letters (e.g., S, F, and A) tend to reflect their written frequency (occurrence) in the English language.

For the Stroop Color and Word Test, the main effect of condition was significant. Specifically, women named/read significantly more words as compared to color or color-words. They also named significantly more colors as compared to color-words. These findings are consistent with previous normative data (Golden, 1978) and suggest an increase in task difficulty from word, to color, to color-word conditions. These findings also support the color-word interference effect (see Golden, 1978) where automatic verbal processing responses interfere with the instructions to name the colors in which words are printed rather than the written words.

For the Trail Making Test, women completed Part A of the test significantly quicker than Part B. This finding

reflects past research (Heaton et al., 1991; Kennedy, 1981) and is congruent with the widely held assumption that Part B, as it requires attention maintenance over two sets of symbols (i.e., numbers and letters) and the rapid integration of numbers and letters, is a more difficult task than Part A which only requires the rapid sequencing of numerical digits (Jarvis & Barth, 1994; Reitan & Wolfson, 1985).

Analysis of the descriptive measures also revealed a number of significant findings that were expected. For the Crandell Cognitions Inventory (CCI) Total Score, depressed women scored significantly higher (mean = 119.27) than did their nondepressed counterparts (mean = 45.20). This finding provided evidence that the depressed group, as opposed to the nondepressed group, was experiencing significant depressive thoughts. Crandell et al. (1993) have noted that scores greater than 101 typically denote significant depressive thinking.

On the CCI Detachment Subscale, depressed women obtained significantly higher scores than did nondepressed women. According to Crandell and Chambless (1986), higher scores on this factor tend to reflect greater thoughts of detachment and behavioral withdrawal from activities and other people. Similarly, depressed women scored significantly higher on the CCI Self-rated Inferiority

factor as contrasted to nondepressives. Higher scores on this scale are suggestive of negative views of the self (Crandell & Chambless, 1986).

On the CCI Helplessness Subscale, depressed women obtained significantly higher scores as compared to nondepressed women. Elevated scores on this factor tend to indicate personal helplessness in relation to the world (Crandell & Chambless, 1986). Depressed, as opposed to nondepressed women, also scored significantly higher on the CCI Hopelessness Subscale. Higher scores on this factor have been suggested to reflect a negative view of the future.

In sum, the findings from the CCI provide additional evidence which supported the classification of the women into depressed and nondepressed groups. Furthermore, the significantly higher scores displayed by the depressives on the Self-rated Inferiority and Hopelessness subscales lend credence to Beck's cognitive theory of depression and negative cognitive triad (Beck, 1967; Beck, Rush, Shaw, & Emery, 1979) that depressives tend to have negative views of the self and the future respectively. Beck's theorized negative views of the world were also partially supported by the depressives' higher scores on the Helplessness; however, this factor tends to only reflect a lack of control within a personal sphere (Crandell & Chambless, 1986).

There were significant, positive correlations between the Beck Depression Inventory and the CCI Total, Detachment, Self-rated Inferiority, Helplessness, and Hopelessness scores. Specifically, higher BDI scores were associated with higher scores on all of the CCI scales. These findings are consistent with past research (Crandell & Chambless, 1986) which has found significant, positive correlations between BDI and CCI scores and suggest a high degree of convergent validation between these measures.

In summary, this research compared a group of young, unmedicated, outpatient women who were moderately depressed to a group of nondepressed women who were closely matched for age, handedness, educational and intellectual levels. The depressed group was also characterized by elevated levels of state and trait anxiety. Despite past research which has indicated deficits in executive controlled functions and left anterior cerebrum hypoactivation or dysfunction in some samples of depressives, the present study failed to identify any significant differences between depressed and nondepressed women on all of the neuropsychological measures purported to be sensitive to executive functioning, except one. These results argue against the frequently held stereotype that depressed individuals typically display impaired performances on neurocognitive tasks. The results also provided little/no

behavioral support for past studies which have found evidence of hemispheric asymmetries over the anterior cerebral regions in depressives. It remains unknown if the depressed women actually suffered from mild left anterior cerebral hypoactivation or dysfunction (as suggested in previous studies), and the neuropsychological tests were generally not of sufficient sensitivity to detect any executive function deficits. Alternatively, it may have been that no significant hemispheric asymmetries were present in these depressives which, in turn, were reflected in their unimpaired neuropsychological test performances. It was concluded that it appears imperative to precisely identify the profiles of depressives who are likely/unlikely to exhibit such deficits. A discussion followed which elaborated on how the depressed subjects in the present study differed from those utilized in past studies. These differences included use of a relatively homogenous group of young, unmedicated, moderately depressed, outpatient women who did not have extensive histories of depression. These women, who were relatively well educated and intellectually bright, also exhibited a degree of motivation and interest via their willingness to participate in this research. Additionally, the possible implications of women being less lateralized than men were discussed. Although it remains unknown which, if any, of these variables were responsible

for the present findings, it was hypothesized that several of these factors may have interacted synergistically to produce the results.

The primary findings from this study appear to have implications for clinical practice. First, it should be noted that the depressed women examined in the present study may closely resemble young depressives that would typically be seen by clinicians on an outpatient basis. Specifically, it is likely that many depressives who actively seek outpatient treatment would be unmedicated, moderately to severely depressed, relatively functional, and not in need of inpatient services. Based on past research which has indicated depression is two times more common among women than men (American Psychiatric Association, 1994; Flor-Henry, 1978; Weissman & Klerman, 1977), these depressives are also likely to be women as well as to be relatively well educated and intellectually bright. Furthermore, they may also self-report elevated levels of anxiety as a comorbid feature. Caution must be advised, however, in generalizing the results of this study to depressives whose demographic and clinical profiles differ significantly from the women examined in the present study. However, based on the primary neuropsychological findings from this study, if executive control deficits are demonstrated in depressed women with profiles that are similar to the depressives in

the present study, then the clinician should be sensitive to the possibility that these deficits are due to other past or present brain abnormalities (e.g., past head injuries, neoplasms, etc.) rather than solely a function of depression. Furthermore, as the anterior cerebral regions (especially the left) appear to be relatively intact neuropsychologically in such depressed women, these individuals may likely be good candidates for talk therapies (e.g., cognitive therapy) which utilizes and focuses on their more rational, logical and positive left-hemisphere controlled verbal abilities (see Crews & Harrison, 1995).

Future research is needed to replicate this study's findings and which systematically examines the effects of differing demographic (i.e., genders, ages, educational and intelligence levels), and classification (i.e., depression severity, levels of anxiety) variables on the neuropsychological test performances of unmedicated, outpatient depressives. These investigations should precisely identify the characteristics of their samples so that cross-study comparisons can more easily be made. Research is also needed which examines the relationship between depressives' neuropsychological test performances and hemispheric activation asymmetries as assessed via EEG and neuroimaging techniques. Finally, continued research and development of new neuropsychological measures is needed

which are highly sensitive to the cognitive-behavioral dysfunctions that may possibly result from the cerebral asymmetries which have been associated with depression.

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Appendix A

Authorized Release of Information

In regard to information concerning _____,
permission is given to _____
to: (Name of therapist/agency)

_____ Provide my name to W. David Crews, Jr. as a
potential subject for a research project
concerning the neuropsychological test
performances of women.

_____ Discuss confidential case records and/or test
results with W. David Crews, Jr.

_____ Receive confidential information from W. David
Crews, Jr. upon completion of my participation
in this research project.

Signature of Client

Date

Information sent and/or received through this
authorization may not be re-released to any other
individual or agency without specific written permission.

Appendix B

Handedness Questionnaire

Subject #: _____

Circle the appropriate number after each item.

| | Right | Left | Both |
|---------------------------------------------------------------------------------------------------------------------------|-------|------|------|
| With which hand would you throw a ball to hit a target?..... | 1 | -1 | 0 |
| With which hand do you draw?..... | 1 | -1 | 0 |
| With which hand do you use an eraser on paper?..... | 1 | -1 | 0 |
| With which hand do you remove the top card when dealing?..... | 1 | -1 | 0 |
| With which foot do you kick a ball?..... | 1 | -1 | 0 |
| If you wanted to pick up a pebble with your toes, which foot would you use?..... | 1 | -1 | 0 |
| If you had to step up onto a chair, which foot would you place on the chair first?..... | 1 | -1 | 0 |
| Which eye would you use to peep through a keyhole?..... | 1 | -1 | 0 |
| If you had to look into a dark bottle to see how full it was, which eye would you use?..... | 1 | -1 | 0 |
| Which eye would you use to sight down a rifle?..... | 1 | -1 | 0 |
| If you wanted to listen to a conversation going on behind a closed door, which ear would you place against the door?..... | 1 | -1 | 0 |
| If you wanted to listen to someone's heartbeat, which ear would you place against their chest?..... | 1 | -1 | 0 |
| Into which ear would you place the earphone of a transistor radio?..... | 1 | -1 | 0 |

of Right + # of Left = Total Score

_____ + _____ = _____

Is mother left or right hand dominant? _____

Is father left or right hand dominant? _____

Appendix C

ANXIETY DISORDERS INTERVIEW SCHEDULE — REVISED (ADIS-R)

**Phobia and Anxiety Disorders Clinic
David H. Barlow, Ph.D., Director
Center for Stress and Anxiety Disorders
State University of New York at Albany**

**Peter A. Di Nardo¹
David H. Barlow²**

¹State University of New York at Oneonta

²Address inquiries to:

**David H. Barlow, Ph.D.
Phobia and Anxiety Disorders Clinic
1535 Western Avenue, Albany, New York 12203**

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Name: _____

Address: _____

Phone: (home) _____

(work) _____

Date of Birth: _____

Sex: M F

Marital Status:

____ Married _____ Date

____ Single

____ Cohabiting _____ Date

____ Separated _____ Date

____ Divorced _____ Date

____ Widowed _____ Date

____ Other

Occupation History:

Patient: _____ (present/date)

_____ (previous/date)

Spouse: _____ (present/date)

_____ (previous/date)

Date of Interview: _____

Interviewer: _____

Family Income: _____

Number of Dependents: _____

Fee for Interview: _____

Previous Marriages:

Yes No

Dates: _____

Children

| <u>Age</u> | <u>Sex</u> | <u>At Home</u> | <u>When Left</u> |
|------------|------------|----------------|------------------|
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |

Education

Patient: _____

Spouse: _____

Religion: _____

The interview should begin with a brief introduction and explanation of the purpose of the interview and obtain a brief description of the presenting complaint.

In this section, a preliminary determination of the presence of phobic anxiety, panic attacks, and chronic tension/anxiety should be made.

I will be asking you a number of questions about different areas of your life. First, I would like to get a general idea of what sorts of problems you have had recently. What have they been?

Have you had recent changes in or difficulties with:

Family/Relationships _____

Legal Matters/Police _____

Work/School _____

Financial _____

Health _____

AFTER BRIEF INQUIRY:

Now, I want to ask you more questions about some specific kinds of problems which may or may not apply to you. We have already talked about some of them generally, but now I would like to get more details.

GENERALIZED ANXIETY DISORDER

Questions in this section should be used to establish the presence of tension or anxiety with no apparent cause, or anxiety which is related to excessive worrying about family, job performance, finances, etc., and minor matters. This tension or anxiety is NOT part of, or anticipatory to, panics or phobic anxiety.

Ask Questions 1 and 2.

- | | | |
|-------------------------------------------------------|--------------------------------------------|-----------------------|
| 1. a. <i>What kinds of things do you worry about?</i> | <i>Do you think you worry excessively?</i> | Excessive/Unrealistic |
|-------------------------------------------------------|--------------------------------------------|-----------------------|

If patient identifies anxiety or tension which is anticipatory to panics or exposures to phobic situations, e.g., "I worry about having an attack; I worry whenever I know I will have to cross a bridge," as a major source of anxiety:

- 1) *Are there things other than _____ which make you feel tense, anxious, or worried?*

YES _____ NO _____

If YES, *What are they?*

- b. *During the last six months, have you been bothered by these worries more days than not?*

YES _____ NO _____

2. *Are you a worrier? Do you worry excessively about small things such as being late for an appointment, repairs to the house or car, etc.?*

YES _____ NO _____

 If there are 2 areas of excessive worry, or YES to Question 2, continue:
 If NO, go to **HAMILTON SCALES** (optional) (p. 11) or **PTSD** (p. 20)

3. *On an average day over the last month, what percent [how much] of the day do you feel tense, anxious, worried?*

_____ %

4. *Last time you experienced an increase in tension, anxiety, or worry, [aside from panics or phobic exposures], what was happening/what were you thinking?*

When _____
 Situation _____
 Thoughts _____

5. *How long has the tension, anxiety, worry been a problem?*

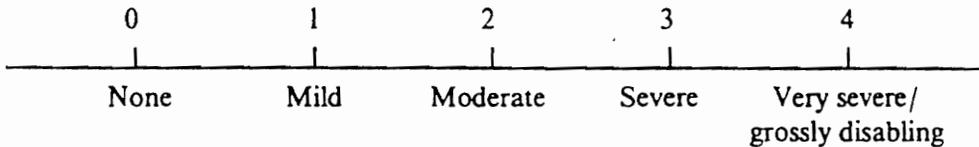
FROM _____ TO _____

Duration in months _____

NOTE: If patient responds "all my life," inquire further, e.g., *Can you remember feeling this way in school? What grade?*

6. *How much does this interfere with your life, work, social activities, family, etc.?*

Rate interference:



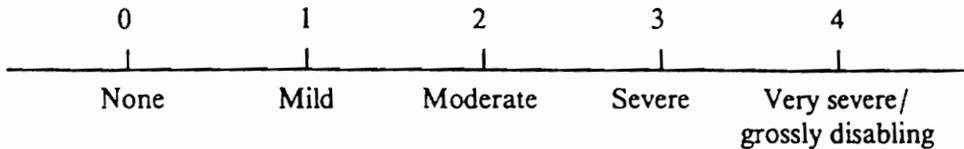
If Hamilton Scales are to be administered, GAD symptom ratings are derived from designated Hamilton Anxiety Scale items
Go to **HAMILTONS** (p. 11). Otherwise continue

7. Generalized Anxiety Disorder Symptom Rating

Persistent symptoms (continuous for at least 6 months). Do not include symptoms present only during panic.

During the past 6 months, have you often been bothered by _____?

How severe is it?



a. Motor Tension

- _____ 1. Trembling, twitching or feeling shaky
- _____ 2. Muscle tension, aches, or soreness
- _____ 3. Restlessness
- _____ 4. Easy fatigability

b. Autonomic Hyperactivity

- _____ 5. Shortness of breath or smothering sensations
- _____ 6. Palpitations or accelerated heart rate
- _____ 7. Sweating, or cold clammy hands
- _____ 8. Dry mouth
- _____ 9. Dizziness or lightheadedness
- _____ 10. Nausea, diarrhea, or other abdominal distress
- _____ 11. Flashes (hot flashes) or chills
- _____ 12. Frequent urination
- _____ 13. Trouble swallowing or lump in throat

c. Vigilance, Scanning

- _____ 14. Feeling keyed up or on edge
- _____ 15. Exaggerated startle response
- _____ 16. Trouble falling or staying asleep
- _____ 17. Difficulty concentrating or mind going blank because of anxiety
- _____ 18. Irritability

Go to PTSD (p. 20)

AFFECTIVE DISORDERS

MAJOR DEPRESSIVE EPISODE

1. *Did you ever have a period of time when you felt depressed, sad, hopeless, or lost interest in almost all of your usual activities?*

| | |
|------------------|------------------|
| Depressed Mood | Loss of Interest |
| YES ____ NO ____ | YES ____ NO ____ |

If YES to either depressed mood or loss of interest, or if there is any question about presence of depressive symptoms:

2. a. *Has there ever been a time when you felt this way nearly every day for at least two weeks?*

YES ____ NO ____ FROM _____ TO _____

1) *When was the first time this happened?*

FROM _____ TO _____

2) *When was the worst?*

YES ____ NO ____ FROM _____ TO _____

b. *Have you been feeling this way nearly every day for the last two weeks?*

YES ____ NO ____

1) If YES, inquire about length of current episode.

SINCE _____

If YES, to either a. or b., continue inquiry.
If NO to a. and b., go to **DYSTHYMIC DISORDER**, Question 1. (p. 41)

If not currently depressed:

c. *When was the most recent period when you felt this way for at least two weeks?*

FROM _____ TO _____

3. Rate severity of symptoms during worst and current or most recent episode on the 0—4 scale. If there is any doubt that the symptom was intermittent, ask: *Was this nearly every day for two weeks?*

| | <u>CURRENT OR MOST RECENT</u> | <u>WORST</u> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--------------|
| a. Changes (loss or gain) in appetite, weight. | _____ | _____ |
| b. Insomnia or hypersomnia | _____ | _____ |
| c. Psychomotor agitation or retardation. <i>Unable to sit still, or so slowed down that you could hardly move or carry on conversation? Must be observable, not merely subjective.</i> | _____ | _____ |
| d. Loss of energy or fatigue. | _____ | _____ |
| e. Worthlessness or excessive, inappropriate guilt. <i>Do you blame yourself for anything, or feel guilty?</i> | _____ | _____ |
| f. Impaired concentration, slowed thinking, indecisiveness. <i>Thinking been slowed down, hard to make decisions?</i> | _____ | _____ |
| g. Thoughts of death or suicide. Suicide attempts. <i>Think about death or hurting yourself? How much do you think about it?</i> | _____ | _____ |

Diagnosis of MAJOR DEPRESSIVE EPISODE requires 4 symptoms nearly every day for at least two weeks. (3 symptoms are required if depressed mood and loss of interest)

If patient does not meet criteria for MDE (past or current),
go to **DYSTHYMIC DISORDER**, Question 1 (p. 41)

4. If inquiry has established the presence of at least one MAJOR DEPRESSIVE EPISODE, check for precipitants.

What had happened in your life just before these feelings came on? Had you lost someone close, been ill or had an accident, had emotional or drinking problems?

Did you try to get help for the depression?

| <u>EPISODE (dates)</u> | <u>PRECIPITANTS</u> | <u>TREATMENT</u> |
|------------------------|---------------------|------------------|
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |

Go to **DYSTHYMIC DISORDER**, Question 2. (p. 42)

DYSTHYMIC DISORDER

If patient meets criteria for **MAJOR DEPRESSIVE EPISODE** (current or past),
go to Question 2. (p. 42)

1. a. *Have you ever had a period of at least two years when you felt down, blue, depressed, or lost interest in things that give you pleasure?*

YES _____ NO _____
When? _____ From _____ To _____

If NO, skip to **MANIA**, (p. 44)

If YES

- b. *Did you feel this way more days than not?*

YES _____ NO _____

- c. *Did you feel this way most of the day?*

YES _____ NO _____

If NO to either b or c, skip to **MANIA**, (p. 44)

- d. *During this time did you have periods of at least 2 months when your mood was normal?*

YES _____ NO _____

If NO, go to Question 3 (p. 43) to rate symptom severity

If YES to d:

- e. *Was there ever an entire two year period in which you were consistently depressed without a 2 month break of feeling normal?*

YES _____ NO _____
When? _____ From _____ To _____

If YES, go to Question 3, (p. 43)
If NO, go to **MANIA**, (p. 44)

If patient meets criteria for MAJOR DEPRESSIVE EPISODE:

2. a. *Other than the times when you felt (Major Depressive Episode), have you had a two year period when you often had days when you were in a depressed mood or lost interest in things?*

If YES, or if in doubt about frequency:

b. *Was that more days than not?* YES _____ NO _____

c. *Did the feeling last most of the day?* YES _____ NO _____

If NO, skip to DEPRESSION & ANXIETY, (p. 44)

- d. *During that period, what was the longest period of time that you didn't feel down, depressed, etc.?*

FROM _____ TO _____

- e. *Did this period come before the time when you had your (Major Depressive Episode) or after you had recovered from (MDE)?*

Prior to MDE _____ How Long _____

After remission of MDE _____ How Long _____

If dysthymic episode preceded MDE by at least two years,
or occurred 6 months after remission of MDE,
go to Question 3 (p. 43)

If not, go to DEPRESSION AND ANXIETY (p. 44)

3. Rate symptom severity for current and past episode on 0—4 scale.

During that time, did you have/experience, were you

| | <u>CURRENT</u> | <u>PAST</u> |
|--------------------------------------------------------------------------------------------------------------------|----------------|-------------|
| a. Poor appetite or overeating | _____ | _____ |
| b. Insomnia or hypersomnia. <i>Have trouble sleeping, or sleeping too much?</i> | _____ | _____ |
| c. Low energy or chronically tired. <i>Tired all the time?</i> | _____ | _____ |
| d. Feelings of inadequacy, loss of self-esteem, self-deprecation. <i>Down on yourself, feeling like a failure?</i> | _____ | _____ |
| e. Poor concentration or difficulty making decisions. | _____ | _____ |
| f. Pessimistic attitude toward future, brooding about past, feeling sorry for self. | _____ | _____ |

Diagnosis of Dysthymic Disorder requires 2 symptoms of a least moderate severity for 2 years. During depressed periods, depressed mood or loss of interest must be prominent.

If patient meets criteria, for each episode:

4. *Did you try to get help for the depression?*

| <u>EPISODE</u> | <u>PRECIPITANT</u> | <u>TREATMENT</u> |
|----------------|--------------------|------------------|
| _____ | _____ | _____ |
| _____ | _____ | _____ |

If patient meets criteria for either Major Depression
or Dysthymic Disorder, or reports significant depressive
symptomatology which does not meet the criteria,
go to **DEPRESSION AND ANXIETY** (p. 44)
If not, go to **MANIA**, (p. 44)

DEPRESSION AND ANXIETY

If patient has reported both depression and anxiety:

1. *What seems to be more troublesome now? The anxiety or the depression?*

EQUAL _____ ANXIETY _____ DEPRESSION _____

2. If currently depressed and anxious: Which happened first this time, the anxiety or the depression?

SAME TIME _____ ANXIETY _____ DEPRESSION _____

3. a. *Has there been a period of time when you experienced the depression without the anxiety?*

YES _____ NO _____ How long? _____ When _____

3. b. *Has there been a time when you experienced the anxiety without the depression?*

YES _____ NO _____ How long? _____ When _____

MANIA

1. *Did you ever have a period of time of at least a week when you felt extremely good or high - feeling very different from being in a "good mood?", or unusually irritable?*

- a. *I'm talking about things like:*

- 1) Inflated self-esteem *feeling you were a special person, had special powers* YES _____ NO _____
- 2) Decreased need for sleep (e.g., feels rested after only 3 hours of sleep) YES _____ NO _____
- 3) More talkative than usual or pressure to keep talking so that others couldn't keep up with your conversation YES _____ NO _____
- 4) Flight of ideas or feeling that thoughts are racing YES _____ NO _____
- 5) Distractibility YES _____ NO _____
- 6) Increase in activity (socially, work, sexual) or restlessness YES _____ NO _____
- 7) Doing or planning activities with a high potential for painful consequences, which is not recognized (e.g., buying sprees, foolish investments, sexual behavior) YES _____ NO _____

If YES to 3 symptoms (4 if mood is only irritable) or questionable, continue inquiry.

If NO, Skip to ALCOHOLISM AND DRUG ABUSE

2. a. *When was the first time you experienced this?*

FROM ___ TO ___

b. *How many times has this happened?*

Each episode: FROM ___ TO ___

FROM ___ TO ___

FROM ___ TO ___

c. For each episode:

Was this period immediately preceded or followed by a period of depression?

CYCLOTHYMIC DISORDER

If the patient reports both periods of depressive symptoms and manic symptoms (not as severe or of the duration needed for those disorders) for the past 2 years, consider Cyclothymic Disorder.

Cyclothymic Disorder requires numerous periods where some symptoms of both depressive and manic syndromes are present. The periods may be separated by normal mood periods as long as a few months, they may be intermixed, or may alternate.

ALCOHOLISM AND DRUG ABUSE

1. *How much do you usually drink? Do you take any recreational or illegal drugs such as Marijuana, Cocaine?*

Indicate which substance(s) is (are) being rated.

a. *When do you use _____? Before breakfast, binges, parties, social gatherings, etc. Pathological use is defined by problems such as constant intoxication, binges, use despite physical complications, blackouts, etc.*

1 month or greater period of pathological use

CURRENT YES _____ NO _____

PAST YES _____ NO _____

SUMMARY

What is the primary problem you want help with? What is the major change you would like to make?

Is there anything else that I haven't covered?

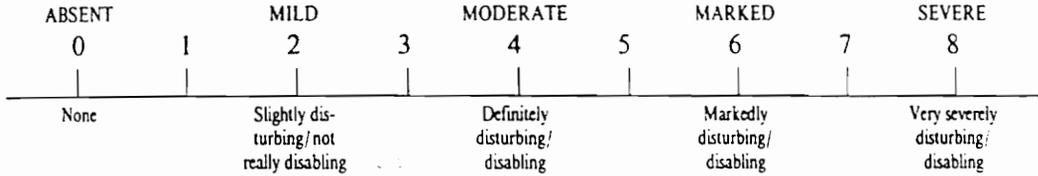
MENTAL STATUS

INTERVIEW BEHAVIOR

NOTES

CLINICIAN'S RATINGS AND DIAGNOSES

In some cases, multiple primary diagnoses may be assigned.



DSM-III-R DIAGNOSIS

| | <u>PRIMARY DIAGNOSIS</u> | <u>SEVERITY RATING</u> | <u>ADDITIONAL DIAGNOSES</u> | <u>SEVERITY RATING</u> |
|----------|--------------------------|------------------------|-----------------------------|------------------------|
| AXIS I | _____ | _____ | _____ | _____ |
| AXIS II | _____ | _____ | _____ | _____ |
| AXIS III | _____ | _____ | | |
| AXIS IV | Acute (_____) | Enduring (____) | | |
| AXIS V | Present (_____) | Last Year (____) | | |
| | <u>PAST EPISODES</u> | <u>SEVERITY RATING</u> | | |
| | _____ | _____ | | |
| | _____ | _____ | | |
| | _____ | _____ | | |

Hamilton Anxiety Rating Scale: _____

Hamilton Depression Rating Scale: _____

Time: Start _____ Stop _____

Diagnostic confidence rating (0-100) _____

If rating is below 70, please comment:

Appendix D

NAME _____

DATE _____

On this questionnaire are groups of statements. Please read each group of statements carefully. Then pick out the one statement in each group which best describes the way you have been feeling the past week, including today! Circle the number beside the statement you picked. If several statements in the group seem to apply equally, circle each one. ***BE SURE TO READ ALL THE STATEMENTS IN EACH GROUP BEFORE MAKING YOUR CHOICE.***

1. 0 I do not feel sad.
1 I feel sad.
2 I am sad all the time, and I can't snap out of it.
3 I am so sad or unhappy that I can't stand it.

2. 0 I am not particularly discouraged about the future.
1 I feel discouraged about the future.
2 I feel I have nothing to look forward to.
3 I feel that the future is hopeless and that things cannot improve.

3. 0 I do not feel like a failure.
1 I feel I have failed more than the average person.
2 As I look back on my life, all I can see is a lot of failures.
3 I feel I am a complete failure as a person.

4. 0 I get as much satisfaction out of things as I used to.
1 I don't enjoy things the way I used to.
2 I don't get real satisfaction out of anything anymore.
3 I am dissatisfied or bored with everything.

5. 0 I don't feel particularly guilty.
1 I feel guilty a good part of the time.
2 I feel guilty most of the time.
3 I feel guilty all of the time.

6. 0 I don't feel I am being punished.
1 I feel I may be punished.
2 I expect to be punished.
3 I feel I am being punished.

7. 0 I don't feel disappointed in myself.
1 I am disappointed in myself.
2 I am disgusted with myself.
3 I hate myself.

over please

8. 0 I don't feel any worse than anybody else.
 1 I am critical of myself for my weaknesses or mistakes.
 2 I blame myself all the time for my faults.
 3 I blame myself for everything bad that happens.
9. 0 I don't have any thoughts of killing myself.
 1 I have thoughts of killing myself, but I would not carry them out.
 2 I would like to kill myself.
 3 I would kill myself if I had the chance.
10. 0 I don't cry any more than usual.
 1 I cry more now than I used to.
 2 I cry all the time now.
 3 I used to be able to cry, but now I can't cry even though I want to.
11. 0 I am no more irritated now than I ever am.
 1 I get annoyed or irritated more easily than I used to.
 2 I feel irritated all the time now.
 3 I don't get irritated at all by the things that used to irritate me.
12. 0 I have not lost interest in other people.
 1 I am less interested in other people than I used to be.
 2 I have lost most of my interest in other people.
 3 I have lost all of my interest in other people.
13. 0 I make decisions about as well as I ever could.
 1 I put off making decisions more than I used to.
 2 I have greater difficulty in making decisions than ever before.
 3 I can't make decisions at all anymore.
14. 0 I don't feel I look any worse than I used to.
 1 I am worried that I am looking old or unattractive.
 2 I feel that there are permanent changes in my appearance that make me look unattractive.
 3 I believe that I look ugly.
15. 0 I can work about as well as before.
 1 It takes an extra effort to get started at doing something.
 2 I have to push myself very hard to do anything.
 3 I can't do any work at all.

16. 0 I can sleep as well as usual.
1 I don't sleep as well as I used to.
2 I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
3 I wake up several hours earlier than I used to and cannot get back to sleep.
17. 0 I don't get more tired than usual.
1 I get tired more easily than I used to.
2 I get tired from doing almost anything.
3 I am too tired to do anything.
18. 0 My appetite is no worse than usual.
1 My appetite is not as good as it used to be.
2 My appetite is much worse now.
3 I have no appetite at all anymore.
19. 0 I haven't lost much weight, if any, lately.
1 I have lost more than 5 pounds.
2 I have lost more than 10 pounds.
3 I have lost more than 15 pounds.
- *** > I am purposefully trying to lose weight by eating less YES____,NO_____.
20. 0 I am no more worried about my health than usual.
1 I am worried about my physical problems such as aches and pains; or upset stomach; or constipation.
2 I am very worried about physical problems and it's hard to think of much else.
3 I am so worried about my physical problems that I cannot think about anything else.
21. 0 I have not noticed any recent change in my interest in sex.
1 I am less interested in sex than I used to be.
2 I am much less interested in sex now.
3 I have lost interest in sex completely.

Appendix E

Crandell Cognitions Inventory

In the list of statements below, you may find some statements which almost always come into your mind and other statements which almost never occur to you. Read each statement carefully and try to decide how often you think this thought or a thought similar to it. Some of the statements may not be your exact thought but may be very similar to your thought. Also try to answer the question, "How frequently do I think this thought or a thought similar to it?" NOT "Is this statement true for me?"

When you have decided how frequently you think a certain thought, put a mark in the appropriate space next to the thought to indicate how often you think that thought: (a) Almost Never, (b) Seldom, (c) Sometimes, (d) Frequently, (e) Almost Always.

For example, if you almost always think the thought, place a mark in the space under the column labeled Almost Always next to that thought. If you almost never think the thought, place a mark in the space under the column labeled Almost Never next to that thought.

Remember to indicate how frequently you think this thought or a thought similar to it, NOT to indicate if the statement is true for you.

| | <u>Almost Never</u> | <u>Seldom</u> | <u>Some- times</u> | <u>Frequently</u> | <u>Almost Always</u> |
|--------------------------------------------------------|-------------------------|---------------|------------------------|-------------------|--------------------------|
| 1. I'm just a nobody. | () | () | () | () | () |
| 2. I feel so full of energy. | () | () | () | () | () |
| 3. I'll never feel good again. | () | () | () | () | () |
| 4. I sure have wasted the opportunities in my life. | () | () | () | () | () |
| 5. I don't know what I should do. | () | () | () | () | () |
| 6. I'm always letting myself down. | () | () | () | () | () |
| 7. Some people really care about me. | () | () | () | () | () |
| 8. I've made such a mess of my life. | () | () | () | () | () |
| 9. What a great day to be alive. | () | () | () | () | () |
| 10. Nothing ever works out for me anymore. | () | () | () | () | () |
| 11. Things really look hopeless. | () | () | () | () | () |
| 12. Why can't I be happy? | () | () | () | () | () |
| 13. It all seems so useless. | () | () | () | () | () |
| 14. There's so much to live for. | () | () | () | () | () |

| | <u>Almost Never</u> | <u>Seldom</u> | <u>Some- times</u> | <u>Frequently</u> | <u>Almost Always</u> |
|-------------------------------------------------------------|-------------------------|---------------|------------------------|-------------------|--------------------------|
| 15. I just don't cut it. | () | () | () | () | () |
| 16. I sure am bored. | () | () | () | () | () |
| 17. My life is so confused, I'll never straighten it out. | () | () | () | () | () |
| 18. I'm a burden to my family. | () | () | () | () | () |
| 19. People like me when they get to know me. | () | () | () | () | () |
| 20. I'll never be happy with myself. | () | () | () | () | () |
| 21. I'm glad I was born. | () | () | () | () | () |
| 22. There's no way out of this mess. | () | () | () | () | () |
| 23. I don't seem to have the energy to get through the day. | () | () | () | () | () |
| 24. I really can't do what's expected of me. | () | () | () | () | () |
| 25. I have such good friends. | () | () | () | () | () |
| 26. No one can know how alone I feel. | () | () | () | () | () |
| 27. I'll never do as well as others. | () | () | () | () | () |
| 28. Everything I do is a failure. | () | () | () | () | () |
| 29. I don't even feel like going out of the house. | () | () | () | () | () |
| 30. I'm a real disappointment to my family. | () | () | () | () | () |
| 31. I'm somebody special. | () | () | () | () | () |
| 32. I feel so detached; I just can't communicate. | () | () | () | () | () |
| 33. I mess everything up. | () | () | () | () | () |
| 34. I'm happy with myself. | () | () | () | () | () |
| 35. I know what I should do, but I just can't do it. | () | () | () | () | () |
| 36. Nothing's ever going to work out for me. | () | () | () | () | () |

| | <u>Almost Never</u> | <u>Seldom</u> | <u>Some- times</u> | <u>Frequently</u> | <u>Almost Always</u> |
|-------------------------------------------------------|-------------------------|---------------|------------------------|-------------------|--------------------------|
| 37. I feel trapped. | () | () | () | () | () |
| 38. Daytimes are bad, but nighttimes are terrible. | () | () | () | () | () |
| 39. I just wish it would be all over. | () | () | () | () | () |
| 40. I know people really enjoy being with me. | () | () | () | () | () |
| 41. Nothing seems exciting anymore. | () | () | () | () | () |
| 42. I'm really a good person. | () | () | () | () | () |
| 43. I wish people would just leave me alone. | () | () | () | () | () |
| 44. Nobody cares about me. | () | () | () | () | () |
| 45. I feel so helpless. | () | () | () | () | () |

Appendix F SELF-EVALUATION QUESTIONNAIRE

Developed by Charles D. Spielberger
in collaboration with
R. L. Gorsuch, R. Lushene, P. R. Vagg, and G. A. Jacobs

STAI Form Y-1

Name _____ Date _____ S _____
Age _____ Sex: M _____ F _____ T _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you feel *right now*, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

VERY MUCH SO
MODERATELY SO
SOMEWHAT
NOT AT ALL

- | | | | | |
|------------------------------------------------------------|---|---|---|---|
| 1. I feel calm | ① | ② | ③ | ④ |
| 2. I feel secure | ① | ② | ③ | ④ |
| 3. I am tense | ① | ② | ③ | ④ |
| 4. I feel strained | ① | ② | ③ | ④ |
| 5. I feel at ease | ① | ② | ③ | ④ |
| 6. I feel upset | ① | ② | ③ | ④ |
| 7. I am presently worrying over possible misfortunes | ① | ② | ③ | ④ |
| 8. I feel satisfied | ① | ② | ③ | ④ |
| 9. I feel frightened | ① | ② | ③ | ④ |
| 10. I feel comfortable | ① | ② | ③ | ④ |
| 11. I feel self-confident | ① | ② | ③ | ④ |
| 12. I feel nervous | ① | ② | ③ | ④ |
| 13. I am jittery | ① | ② | ③ | ④ |
| 14. I feel indecisive | ① | ② | ③ | ④ |
| 15. I am relaxed | ① | ② | ③ | ④ |
| 16. I feel content | ① | ② | ③ | ④ |
| 17. I am worried | ① | ② | ③ | ④ |
| 18. I feel confused | ① | ② | ③ | ④ |
| 19. I feel steady | ① | ② | ③ | ④ |
| 20. I feel pleasant | ① | ② | ③ | ④ |



SELF-EVALUATION QUESTIONNAIRE

STAI Form Y-2

Name _____ Date _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

ALMOST NEVER
SOMETIMES
OFTEN
ALMOST ALWAYS

- | | | | | |
|------------------------------------------------------------------------------------------------------|---|---|---|---|
| 21. I feel pleasant | ① | ② | ③ | ④ |
| 22. I feel nervous and restless | ① | ② | ③ | ④ |
| 23. I feel satisfied with myself | ① | ② | ③ | ④ |
| 24. I wish I could be as happy as others seem to be | ① | ② | ③ | ④ |
| 25. I feel like a failure | ① | ② | ③ | ④ |
| 26. I feel rested | ① | ② | ③ | ④ |
| 27. I am "calm, cool, and collected" | ① | ② | ③ | ④ |
| 28. I feel that difficulties are piling up so that I cannot overcome them | ① | ② | ③ | ④ |
| 29. I worry too much over something that really doesn't matter | ① | ② | ③ | ④ |
| 30. I am happy | ① | ② | ③ | ④ |
| 31. I have disturbing thoughts | ① | ② | ③ | ④ |
| 32. I lack self-confidence | ① | ② | ③ | ④ |
| 33. I feel secure | ① | ② | ③ | ④ |
| 34. I make decisions easily | ① | ② | ③ | ④ |
| 35. I feel inadequate | ① | ② | ③ | ④ |
| 36. I am content | ① | ② | ③ | ④ |
| 37. Some unimportant thought runs through my mind and bothers me | ① | ② | ③ | ④ |
| 38. I take disappointments so keenly that I can't put them out of my mind | ① | ② | ③ | ④ |
| 39. I am a steady person | ① | ② | ③ | ④ |
| 40. I get in a state of tension or turmoil as I think over my recent concerns and interests | ① | ② | ③ | ④ |

Appendix G

History Questionnaire

NAME: _____ AGE: _____

Have you ever experienced or been diagnosed with any of the following, or are you experiencing any of the following at present? Please circle the appropriate response and explain "Yes" answers below.

- | | | |
|-----------------------------------------------------------------------------|-----|----|
| 1. Severe head trauma/injury | Yes | No |
| 2. Stroke | Yes | No |
| 3. Learning disabilities (problems of reading, writing, or comprehension) | Yes | No |
| 4. Epilepsy or seizures | Yes | No |
| 5. Paralysis | Yes | No |
| 6. Neurological surgery | Yes | No |
| 7. Other neurological/nervous system problems | Yes | No |
| 8. Concussion with loss of consciousness | Yes | No |
| 9. Eating disorders (i.e., anorexia or bulimia) | Yes | No |
| 10. Alcohol or drug problems | Yes | No |
| 11. Using alcohol or drugs (other than for purposes prescribed) at present? | Yes | No |
| 12. Past psychological/psychiatric problems | Yes | No |
| 13. Are you currently taking any prescription medications/drugs? | Yes | No |
| 14. Are you currently suffering from any medical conditions or illnesses? | Yes | No |

Please explain any "Yes responses:

Appendix H

Informed Consent Form

TITLE OF EXPERIMENT: Neuropsychological Test Performances of Women:
Effects of Depression on Executive Functions
EXPERIMENT # _____

1. PURPOSE OF EXPERIMENT

You are invited to participate in a study about the neuropsychological test performances of women. This study will primarily involve neuropsychological tests which have been suggested to be sensitive to the executive functions, especially the left anterior cerebrum. Specifically, the purpose of this research is to examine the neuropsychological test performances of outpatient depressed women as compared to a nondepressed control group of women.

2. PROCEDURE TO BE FOLLOWED IN THE STUDY:

To accomplish the goals of the study, you will be asked to individually complete a series of psychological inventories/tests that assesses your handedness, depression, neurological history (brief), anxiety levels, and intellectual abilities. These measures will be used in group (subject) classification. A number of neuropsychological tests will follow for the purpose of examining the executive functions, especially of the anterior cerebral regions. These tasks will include assessment of attention/vigilance, concentration, psychomotor functioning, response inhibition, sequencing, verbal and design fluency, and verbal memory. The research will be conducted by W. David Crews, Jr., M.S., and David W. Harrison, Ph.D. The whole process will occur across two sessions of about one to one and one-half hours each (total time: two to three hours). Additionally, some subjects will be debriefed and excused after either the first or second session if they do not meet eligibility criteria.

3. ANONYMITY OF SUBJECTS AND CONFIDENTIALITY OF RESULTS:

The results of this study will be kept strictly confidential. At no time will the researchers release your results to anyone without your written consent. The information you provide will have your name removed and only a subject number will identify you during analyses and any writeup of the research.

The exception to this confidentiality is if you indicate (verbally or via questionnaire) that you are planning to hurt or kill yourself or someone else. If this occurs, we are bound by law to refer/obtain help for you to prevent such acts.

4. DISCOMFORTS AND RISKS FROM PARTICIPATING IN THE STUDY:

There are no apparent risks to you from participation in this study.

5. BENEFITS OF THIS PROJECT:

Your participation in this project will hopefully help advance the scientific knowledge of the neuropsychological test performances of depressed versus nondepressed women, especially with regard to the executive functions. No guarantee of benefits has been made to encourage you to participate.

6. FREEDOM TO WITHDRAW:

You are free to withdraw from this study at any time without penalty.

7. EXTRA CREDIT OR FINANCIAL COMPENSATION:

Participation will be totally voluntary, without any monetary compensation. However, if you are currently enrolled in an introductory Psychology course at Virginia Tech, you may receive two extra credits for participation in this project.

8. USE OF RESEARCH DATA:

The information from this research may be used for scientific or educational purposes. It may be presented at scientific meetings and/or published and reproduced in professional journals or books, or used for any other purpose that Virginia Tech's Department of Psychology considers proper in the interest of education, knowledge, or research.

9. APPROVAL OF RESEARCH:

This research project has been approved by the Human Subjects committee of the Department of Psychology and by the Institutional Review Board of Virginia Tech.

10. SUBJECT'S PERMISSION:

I have read and understand the above description of the study. I have had an opportunity to ask questions and have had them all answered. I hereby acknowledge the above and give my voluntary consent for participation in this study.

I further understand that if I participate I may withdraw at any time without penalty.

I understand that should I have any questions regarding this research and its conduct, I should contact any of the persons named below.

PRIMARY RESEARCHER: W. David Crews, Jr., M.S. PHONE: 703-953-5516

FACULTY ADVISOR: David W. Harrison, Ph.D. PHONE: 703-231-4422

CHAIR, HSC: Robert J. Harvey, Ph.D. PHONE: 703-231-7030

CHAIR, IRB: Ernest Stout, Ph.D. PHONE: 703-231-6077

SUBJECT'S SIGNATURE: _____

DATE: _____

SUBJECT'S ID: _____

Appendix I

WAIS-R Vocabulary Test

Administration

INSTRUCTIONS: I WANT YOU TO TELL ME THE MEANINGS OF SOME WORDS. LET'S START WITH (SAY THE FOURTH WORD TO SUBJECTS). WHAT DOES (REPEAT WORD) MEAN?

DO: Follow scoring guidelines in the WAIS-R Manual (Wechsler, 1981). If it is difficult to determine if a subject knows the meaning of a word, say: TELL ME MORE ABOUT IT OR EXPLAIN WHAT YOU MEAN.

ANSWERS:

| | 5. VOCABULARY <small>Discontinue after 5 consecutive failures.</small> | Score 2, 1, or 0 |
|---------|------------------------------------------------------------------------|-------------------------------------------------|
| | 1. Bed | |
| | 2. Ship | |
| | 3. Penny | |
| START → | 4. Winter | |
| | 5. Breakfast | |
| | 6. Repair | |
| | 7. Fabric | |
| | 8. Assemble | |
| | 9. Enormous | |
| | 10. Conceal | |
| | 11. Sentence | |
| | 12. Consume | |
| | 13. Regulate | |
| | 14. Terminate | |
| | 15. Commence | |
| | 16. Domestic | |
| | 17. Tranquil | |
| | 18. Ponder | |
| | 19. Designate | |
| | 20. Reluctant | |
| | 21. Obstruct | |
| | 22. Sanctuary | |
| | 23. Compassion | |
| | 24. Evasive | |
| | 25. Remorse | |
| | 26. Perimeter | |
| | 27. Generate | |
| | 28. Matchless | |
| | 29. Fortitude | |
| | 30. Tangible | |
| | 31. Plagiarize | |
| | 32. Ominous | |
| | 33. Encumber | |
| | 34. Audacious | |
| | 35. Tirade | |
| | Note: Be sure to include scores for items 1-3 in total. | Total Max=70 |

(Standardized Administration Procedures from the WAIS-R Manual, Wechsler, 1981)

Appendix J
WAIS-R Block Design Test

Administration

Design 1

DO: Randomly position four standardized blocks on the table in front of the subject.

INSTRUCTIONS: YOU SEE THESE BLOCKS? THEY ARE ALL ALIKE. ON SOME SIDES THEY ARE ALL RED; ON SOME, ALL WHITE; AND ON SOME, HALF RED AND HALF WHITE.

DO: Turn blocks to show different sides.

INSTRUCTIONS: I AM GOING TO PUT THEM TOGETHER TO MAKE A DESIGN. WATCH ME.

DO: Slowly arrange blocks with the design shown on Card 1 without exposing the card to the subject. Leave this model intact. Give four similar blocks to the subject.

INSTRUCTIONS: NOW MAKE ONE JUST LIKE THIS.

DO: Immediately begin timing and allow 60 seconds for subject to complete the design. If the subject finishes the design early, go on to design 2. However, if subject fails, say: WATCH ME AGAIN. Demonstrate construction of the design again using subject's blocks. Afterwards, scramble the subject's blocks while leaving the examiner's model intact.

INSTRUCTIONS: NOW YOU TRY IT AGAIN AND BE SURE TO MAKE IT JUST LIKE MINE.

DO: Immediately begin timing and allow subject 60 seconds to complete the design. Whether or not the subject succeeds or fails on trial 2, proceed to Design 2.

Design 2

INSTRUCTIONS: THIS TIME WE ARE GOING TO PUT THE BLOCKS TOGETHER TO MAKE THEM LOOK LIKE THIS PICTURE (POINT TO CARD WITH DESIGN 2). WATCH ME FIRST.

DO: Construct design slowly using the subject's blocks.

INSTRUCTIONS: When finished, say: YOU SEE THE TOPS OF THESE BLOCKS LOOK THE SAME AS THIS PICTURE. Scramble the blocks and say: NOW LOOK AT THE PICTURE AND MAKE ONE JUST LIKE IT WITH THESE BLOCKS. GO AHEAD.

DO: Begin timing immediately and allow subject 60 seconds. If subject is successful, proceed to Design 3. If subject fails, say: WATCH ME AGAIN. Make the design again and then scramble the subject's blocks and say: NOW TRY AGAIN. Immediately begin timing and allow the subject 60 seconds to complete the design. Proceed to Design 3 whether the subject succeeds or fails.

Designs 3-9

DO: Scramble the blocks. Place the card for Design 3 before the subject and say:

INSTRUCTIONS: NOW MAKE ONE LIKE THIS. TRY TO WORK AS QUICKLY AS YOU CAN. TELL ME WHEN YOU HAVE FINISHED.

DO: Begin timing immediately and allow the subject 60 seconds to complete the design. Whether the subject succeeds or fails, proceed to the next design without giving subjects who fail a second trial. Present the next design.

INSTRUCTIONS: NOW MAKE ONE LIKE THIS. TRY TO WORK AS QUICKLY AS YOU CAN. TELL ME WHEN YOU HAVE FINISHED.

DO: When Design 6 is reached, take out the remaining five blocks and say:

INSTRUCTIONS: NOW MAKE ONE LIKE THIS, USING NINE BLOCKS. BE SURE TO TELL ME WHEN YOU HAVE FINISHED.

DO: Begin timing immediately and allow the subject 60 seconds to complete the design. Whether the subject succeeds or fails, proceed to the next design. Discontinue the test after three consecutive failures.

ANSWERS:

| 6. BLOCK DESIGN Discontinue after 3 consecutive failures. | | | | | | | | | | | | |
|-----------------------------------------------------------|-------|-----------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------|-------|------|---|---|---|---|
| Design | Time | Pass-Fail | Score (Circle the appropriate score for each design) | | | | | | | | | |
| 1. 60" | 1 | | 2 | | | | | | | | | |
| | 2 | | 0 | 1 | | | | | | | | |
| 2. 60" | 1 | | 2 | | | | | | | | | |
| | 2 | | 0 | 1 | | | | | | | | |
| 3. 60" | | | 0 | <table border="0"> <tr> <td>16-40</td> <td>11-15</td> <td>1-10</td> </tr> <tr> <td>4</td> <td>5</td> <td>6</td> </tr> </table> | 16-40 | 11-15 | 1-10 | 4 | 5 | 6 | | |
| 16-40 | 11-15 | 1-10 | | | | | | | | | | |
| 4 | 5 | 6 | | | | | | | | | | |
| 4. 60" | | | 0 | <table border="0"> <tr> <td>16-40</td> <td>11-15</td> <td>1-10</td> </tr> <tr> <td>4</td> <td>5</td> <td>6</td> </tr> </table> | 16-40 | 11-15 | 1-10 | 4 | 5 | 6 | | |
| 16-40 | 11-15 | 1-10 | | | | | | | | | | |
| 4 | 5 | 6 | | | | | | | | | | |
| 5. 60" | | | 0 | <table border="0"> <tr> <td>21-40</td> <td>16-20</td> <td>11-15</td> <td>1-10</td> </tr> <tr> <td>4</td> <td>5</td> <td>6</td> <td>7</td> </tr> </table> | 21-40 | 16-20 | 11-15 | 1-10 | 4 | 5 | 6 | 7 |
| 21-40 | 16-20 | 11-15 | 1-10 | | | | | | | | | |
| 4 | 5 | 6 | 7 | | | | | | | | | |
| 6. 120" | | | 0 | <table border="0"> <tr> <td>26-120</td> <td>26-35</td> <td>21-25</td> <td>1-20</td> </tr> <tr> <td>4</td> <td>5</td> <td>6</td> <td>7</td> </tr> </table> | 26-120 | 26-35 | 21-25 | 1-20 | 4 | 5 | 6 | 7 |
| 26-120 | 26-35 | 21-25 | 1-20 | | | | | | | | | |
| 4 | 5 | 6 | 7 | | | | | | | | | |
| 7. 120" | | | 0 | <table border="0"> <tr> <td>31-120</td> <td>46-60</td> <td>31-45</td> <td>1-30</td> </tr> <tr> <td>4</td> <td>5</td> <td>6</td> <td>7</td> </tr> </table> | 31-120 | 46-60 | 31-45 | 1-30 | 4 | 5 | 6 | 7 |
| 31-120 | 46-60 | 31-45 | 1-30 | | | | | | | | | |
| 4 | 5 | 6 | 7 | | | | | | | | | |
| 8. 120" | | | 0 | <table border="0"> <tr> <td>36-120</td> <td>56-75</td> <td>41-55</td> <td>1-40</td> </tr> <tr> <td>4</td> <td>5</td> <td>6</td> <td>7</td> </tr> </table> | 36-120 | 56-75 | 41-55 | 1-40 | 4 | 5 | 6 | 7 |
| 36-120 | 56-75 | 41-55 | 1-40 | | | | | | | | | |
| 4 | 5 | 6 | 7 | | | | | | | | | |
| 9. 120" | | | 0 | <table border="0"> <tr> <td>41-120</td> <td>56-75</td> <td>41-55</td> <td>1-40</td> </tr> <tr> <td>4</td> <td>5</td> <td>6</td> <td>7</td> </tr> </table> | 41-120 | 56-75 | 41-55 | 1-40 | 4 | 5 | 6 | 7 |
| 41-120 | 56-75 | 41-55 | 1-40 | | | | | | | | | |
| 4 | 5 | 6 | 7 | | | | | | | | | |
| | | | | Max=51 | | | | | | | | |
| | | | | Total | | | | | | | | |

(Standardized Administration Procedures from the WAIS-R Manual, Wechsler, 1981)

Appendix K

DESIGN FLUENCY TEST

This test was designed by Marilyn Jones-Gotman and Brenda Milner as a "right hemisphere" analogue to verbal fluency. The report of this test with unilateral right and left hemisphere patients is published in Neuropsychologia (1977, 15, 653-674).

The materials needed for this test are a ball point pen and some white paper. The test has two parts: (a) a free condition lasting 5 minutes; and (b) a fixed condition lasting 4 minutes.

I. Free Condition (5 minutes)

Subjects are merely told to invent as many drawings as possible. Emphasis is placed on "many" and "different". Two examples are given by the examiner prior to starting this test.

Rules that are given to patient about this test:

1. No drawings of actual objects
2. No drawings of abstract figures that can be named (i.e., a "square")
3. No scribbling
4. No making drawings that are too similar to each other

Subjects are given one warning following the infraction of each of the above rules. Also, Ss who make excessively detailed drawings (resulting in low output) are warned to make as many drawings as possible.

Scoring: The number of drawings are counted. Delete from your count (a) drawings of actual objects; (b) "nameable" objects; (c) obvious scribbling; and (d) perseverations.

II. Fixed Condition (4 minutes)

Subjects are again asked to make as many different, novel drawings as possible. This time, however, each drawing must consist of only four lines. The same rules outlined above (in addition to the 4-line rule) are applied. Two examples are given by the examiner prior to starting the task. Scoring is similar to that described above (with addition that only four lines can be used).

Appendix L

WAIS-R Digit Span

Administration

Digits Forward

INSTRUCTIONS: I AM GOING TO SAY SOME NUMBERS. LISTEN CAREFULLY, AND WHEN I AM THROUGH, SAY THEM RIGHT AFTER ME.

DO: Read digits to subjects at a rate of one per second. Administer both trials of each item even if the subject passes the first trial. Discontinue after failure on both trials of any item. Record all successes and failures and score according to standardized procedures (Wechsler, 1981).

Administration

Digits Backward

INSTRUCTIONS: NOW I AM GOING TO SAY SOME MORE NUMBERS, BUT THIS TIME WHEN I STOP, I WANT YOU TO SAY THEM BACKWARDS. FOR EXAMPLE, IF I SAY 7-1-9, WHAT WOULD YOU SAY?

DO: If the subject gives the correct answer, say: THAT'S RIGHT. If the subject fails the example, say: NO, YOU WOULD SAY 9-1-7. I SAID 7-1-9, SO SAY IT BACKWARDS. YOU WOULD SAY 9-1-7. NOW TRY THESE NUMBERS. REMEMBER, YOU ARE TO SAY THEM BACKWARDS. 3-4-8. Whether subject succeeds or fails with the example, proceed to item 1. Also, give no help on the second example. Discontinue test after failure on both trials of any item. Record all successes and failures and score according to standardized procedures (Wechsler, 1981).

| 3. DIGIT SPAN <small>Discontinue after failure on BOTH TRIALS of any item. Administer BOTH TRIALS of each item, even if subject passes first trial.</small> | | | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------|---------------------|-----------------------|-----------------|
| DIGITS FORWARD | | Pass-Fail | Score 2, 1, or 0 | DIGITS BACKWARD* | |
| | | Pass-Fail | Score 2, 1, or 0 | | |
| 1. | 5-8-2 | | | 1. | 2-4 |
| | 6-9-4 | | | | 5-8 |
| 2. | 6-4-3-8 | | | 2. | 6-2-9 |
| | 7-2-8-6 | | | | 4-1-5 |
| 3. | 4-2-7-3-1 | | | 3. | 3-2-7-9 |
| | 7-5-8-3-6 | | | | 4-9-6-8 |
| 4. | 6-1-9-4-7-3 | | | 4. | 1-5-2-8-6 |
| | 3-9-2-4-8-7 | | | | 6-1-8-4-3 |
| 5. | 5-9-1-7-4-2-8 | | | 5. | 5-3-9-4-1-8 |
| | 4-1-7-9-3-8-6 | | | | 7-2-4-8-5-6 |
| 6. | 5-8-1-9-2-6-4-7 | | | 6. | 8-1-2-9-3-6-5 |
| | 3-8-2-9-5-1-7-4 | | | | 4-7-3-9-1-2-8 |
| 7. | 2-7-5-8-6-2-5-8-4 | | | 7. | 9-4-3-7-6-2-5-8 |
| | 7-1-3-9-4-2-5-6-8 | | | | 7-2-8-1-9-6-5-3 |
| Total Forward | | | Max=14 | Total Backward | |
| | | | | Max=14 | |

*Administer DIGITS BACKWARD even if subject scores 0 on DIGITS FORWARD

| | | | | | |
|---------|---|----------|---|-------|--------|
| | + | | = | | Max=28 |
| Forward | | Backward | | Total | |

(Standardized Administration Procedures from the WAIS-R Manual, Wechsler, 1981)

Appendix M

Dynamometer Task

Administration-Perseveration

INSTRUCTIONS: I WANT YOU TO SQUEEZE THIS AS HARD AS YOU CAN WITH YOUR RIGHT (LEFT) HAND, AND THEN I AM GOING TO ASK YOU TO SQUEEZE IT JUST HALF AS HARD.

DO: Test hand with scale turned away from the subject.

INSTRUCTIONS: NOW I WANT YOU TO DO THE SAME THING WITH YOUR LEFT (RIGHT) HAND.

DO: Test hand with scale turned away from the subject.

Administration-Strength and Fatigue

INSTRUCTIONS: NOW I WANT YOU TO SQUEEZE IT AS HARD AS YOU CAN WITH YOUR RIGHT (LEFT) HAND FIVE TIMES. I WILL TAKE A READING AFTER EACH TRIAL.

DO: Keep scale turned away from the subject, score, and reset your scale for the five trials.

INSTRUCTIONS: NOW I WANT YOU TO SQUEEZE IT AS HARD AS YOU CAN WITH YOUR LEFT (RIGHT) HAND FIVE TIMES.

DO: Keep scale turned away from the subject, score, and reset scale for the five trials.

DYNAMOMETER DATA RECORD

SUBJECT: _____

RIGHT _____; RIGHT (1/2) _____.

LEFT _____; LEFT (1/2) _____.

| <u>TRIAL</u> | RIGHT HAND | <u>TRIAL</u> | LEFT HAND |
|--------------|------------|--------------|-----------|
| 1 | _____ | 1 | _____ |
| 2 | _____ | 2 | _____ |
| 3 | _____ | 3 | _____ |
| 4 | _____ | 4 | _____ |
| 5 | _____ | 5 | _____ |

Appendix N

FAS Test

Administration

INSTRUCTIONS: I AM GOING TO GIVE YOU ONE LETTER OF THE ALPHABET AND I WANT YOU TO WRITE DOWN/SPELL OUT, AS QUICKLY AS YOU CAN, ALL THE WORDS YOU CAN THINK OF THAT BEGIN WITH THIS LETTER. FOR EXAMPLE, IF I GIVE YOU THE LETTER C, YOU MIGHT WRITE DOWN THE WORDS "CAR, CAUTIOUS," AND OTHER WORDS BEGINNING WITH THE SAME LETTER. DO NOT USE WORDS THAT ARE PROPER NAMES, FOR EXAMPLE, CATHY OR CAMERO. ALSO DO NOT USE THE SAME WORD AGAIN WITH A DIFFERENT ENDING (SUFFIX) SUCH AS "COME AND COMING." ARE THERE ANY QUESTIONS? OKAY, PLEASE BEGIN WRITING DOWN ALL THE WORDS YOU CAN THINK OF THAT BEGIN WITH THE LETTER "F" UNTIL I SAY STOP.

DO: Timing begins immediately, with one minute allowed for each letter. At the end of this trial, the test resumes with a one-minute trial of the letter "A," followed by a one-minute trial with the letter "S."

FAS DATA RECORD

Subject _____

| | TOTAL NO. OF WORDS GENERATED | TOTAL NO. OF PERSEVERATIONS | TOTAL NO. OF EMOTIONAL WORDS |
|---------------|---------------------------------|--------------------------------|------------------------------------|
| Trial 1 - "F" | _____ | _____ | _____ |
| Trial 2 - "A" | _____ | _____ | _____ |
| Trial 3 - "S" | _____ | _____ | _____ |
| Total | _____ | _____ | _____ |

(Appendix adopted from Huntzinger, 1989)

Appendix O

Rey Auditory Verbal Learning Test

Administration

Trial 1

INSTRUCTIONS: I AM GOING TO READ A LIST OF WORDS TO YOU. PLEASE LISTEN CAREFULLY. WHEN I STOP, I WANT YOU TO REPEAT TO ME AS MANY OF THE WORDS AS YOU CAN REMEMBER. IT DOESN'T MATTER WHAT ORDER YOU SAY THEM. JUST TRY TO REMEMBER AS MANY WORDS AS YOU CAN. ANY QUESTIONS?

DO: Read List A to subjects at a rate of one word per second. Put a check beside each word that is recalled correctly on the answer sheet.

Trials 2 - 5

INSTRUCTIONS: NOW I AM GOING TO READ THE SAME LIST AGAIN. WHEN I STOP, I WANT YOU TO TELL ME AS MANY WORDS AS YOU CAN REMEMBER, INCLUDING THE WORDS YOU HAVE SAID ON PREVIOUS TRIALS. IT DOESN'T MATTER WHAT ORDER YOU SAY THEM. JUST TRY TO REMEMBER AS MANY WORDS AS YOU CAN FROM THE WORD LIST READ TO YOU.

DO: Read List A at a rate of one word per second. Put a check beside each word that is recalled correctly on the answer sheet.

(Appendix adopted from Huntzinger, 1989.)

REY AUDITORY-VERBAL LEARNING

| LIST A | IA | IIA | IIIA | IVA | VA | LIST B | IB | VIA |
|---------|-------|-------|-------|-------|-------|----------|-------|-------|
| Drum | _____ | _____ | _____ | _____ | _____ | Desk | _____ | _____ |
| Curtain | _____ | _____ | _____ | _____ | _____ | Ranger | _____ | _____ |
| Bell | _____ | _____ | _____ | _____ | _____ | Bird | _____ | _____ |
| Coffee | _____ | _____ | _____ | _____ | _____ | Shoe | _____ | _____ |
| School | _____ | _____ | _____ | _____ | _____ | Stove | _____ | _____ |
| Parent | _____ | _____ | _____ | _____ | _____ | Mountain | _____ | _____ |
| Moon | _____ | _____ | _____ | _____ | _____ | Glasses | _____ | _____ |
| Garden | _____ | _____ | _____ | _____ | _____ | Towel | _____ | _____ |
| Hat | _____ | _____ | _____ | _____ | _____ | Cloud | _____ | _____ |
| Farmer | _____ | _____ | _____ | _____ | _____ | Boat | _____ | _____ |
| Nose | _____ | _____ | _____ | _____ | _____ | Lamb | _____ | _____ |
| Turkey | _____ | _____ | _____ | _____ | _____ | Gun | _____ | _____ |
| Color | _____ | _____ | _____ | _____ | _____ | Pencil | _____ | _____ |
| House | _____ | _____ | _____ | _____ | _____ | Church | _____ | _____ |
| River | _____ | _____ | _____ | _____ | _____ | Fish | _____ | _____ |
| TOTAL: | () | () | () | () | () | | () | () |

IMMEDIATE
RECALL _____

DELAYED
RECALL _____

RECOGNITION _____

Appendix P

Serial Sevens Task

Administration

INSTRUCTIONS: THIS IS A TASK OF SIMPLE MENTAL SUBTRACTION. I WOULD LIKE FOR YOU TO SUBTRACT 7 FROM 100 AND TELL ME YOUR ANSWER. THEN CONTINUE SUBTRACTING OUT LOUD BY SEVENS UNTIL YOU CAN GO NO FURTHER. THERE WILL BE NO TIME LIMIT ON THIS TASK. ANY QUESTIONS? BEGIN.

DO: If subject responds incorrectly on the initial subtraction ($100 - 7 = 93$), correct the subject and ask him/her to subtract seven from 93. If the subject responds correctly, proceed with no further assistance. If the subject again provides the incorrect answer, repeat the instructions to the subject until he/she succeeds or it is clear that they are unable to perform the task. If errors occur on later subtractions, do not correct the subject but base the correctness or incorrectness of each subsequent subtraction on the preceding difference that has been verbalized by the subject. Self-corrected responses by subjects will not be counted as errors.

Serial Sevens Data Record

| Subject | _____ | | |
|----------|-------|----|----|
| Answers: | 100 | 65 | 30 |
| | 93 | 58 | 23 |
| | 86 | 51 | 16 |
| | 79 | 44 | 9 |
| | 72 | 37 | 2 |

Total Errors _____

Total Time _____

(Procedures adopted from Lezak, 1976.)

Appendix Q

Stroop Color and Word Test

Administration - Word Page

INSTRUCTIONS: THIS IS A TEST OF HOW QUICKLY YOU CAN READ THE WORDS ON THIS PAGE. FOR EXAMPLE, (point to the first item) THIS IS THE FIRST ITEM: WHAT WOULD YOU SAY? If subject is correct, go to item two. If incorrect, say: NO, THE WORD IS _____. Continue administering practice trials until the subject correctly names three consecutive items or it becomes clear that it is impossible to continue. Then say: AFTER I SAY "BEGIN," YOU ARE TO READ DOWN THE COLUMNS STARTING WITH THE NEXT ITEM IN THE LEFT-HAND COLUMN UNTIL YOU COMPLETE IT AND THEN CONTINUE, WITHOUT STOPPING, DOWN THE REMAINING COLUMNS IN LEFT TO RIGHT ORDER. IF YOU FINISH ALL COLUMNS BEFORE I SAY "STOP," RETURN TO THE FIRST COLUMN AND BEGIN AGAIN. REMEMBER, DO NOT STOP READING UNTIL I SAY "STOP." READ OUT LOUD AS QUICKLY AS YOU CAN. ANY QUESTIONS? READY? BEGIN.

D0: Start timing immediately and make note of any reading errors and the total number of words correctly read by the end of the 45 seconds. Stop subject's reading after 45 seconds has elapsed.

ANSWERS:

| | | | | |
|-------|-------|-------|-------|-------|
| RED | BLUE | GREEN | RED | BLUE |
| GREEN | GREEN | RED | BLUE | GREEN |
| BLUE | RED | BLUE | GREEN | RED |
| GREEN | BLUE | RED | RED | BLUE |
| RED | RED | GREEN | BLUE | GREEN |
| BLUE | GREEN | BLUE | GREEN | RED |
| RED | BLUE | GREEN | BLUE | GREEN |
| BLUE | GREEN | RED | GREEN | RED |
| GREEN | RED | BLUE | RED | BLUE |
| BLUE | GREEN | GREEN | BLUE | GREEN |
| GREEN | RED | BLUE | RED | RED |
| RED | BLUE | RED | GREEN | BLUE |
| GREEN | RED | BLUE | RED | GREEN |
| BLUE | BLUE | RED | GREEN | RED |
| RED | GREEN | GREEN | BLUE | BLUE |
| BLUE | BLUE | RED | GREEN | RED |
| RED | GREEN | BLUE | RED | GREEN |
| GREEN | RED | GREEN | BLUE | BLUE |
| RED | BLUE | RED | GREEN | RED |
| GREEN | RED | GREEN | BLUE | GREEN |

TOTAL ERRORS _____
(Appendix adopted from Huntzinger, 1989.)

Stroop Color and Word Test, continued

Administration - Color Page

INSTRUCTIONS: THIS IS A TEST OF HOW QUICKLY YOU CAN NAME THE COLORS ON THIS PAGE. YOU WILL COMPLETE THIS PAGE JUST AS YOU DID THE PREVIOUS PAGE, BEGINNING WITH THE FIRST COLUMN ON YOUR LEFT. FOR EXAMPLE, (point to first item), THIS IS THE FIRST ITEM. NAME THE COLOR OF THE INK THE ITEM IS PRINTED IN. If subject is correct, go to item two. If incorrect, say: NO, THE COLOR IS _____. Continue administering practice trials until the subject correctly names three consecutive items, then say: REMEMBER TO NAME THE COLORS OF THE INK OUT LOUD AS QUICKLY AS YOU CAN AND CONTINUE UNTIL I SAY STOP. ANY QUESTIONS? READY? BEGIN.

D0: Start timing immediately and make note of any reading errors and the total number of colors correctly named by the end of the 45 seconds. Stop subject's reading after 45 seconds has elapsed.

ANSWERS:

| | | | | |
|-------|-------|-------|-------|-------|
| BLUE | RED | BLUE | GREEN | RED |
| RED | BLUE | GREEN | RED | BLUE |
| GREEN | GREEN | RED | BLUE | GREEN |
| BLUE | RED | BLUE | GREEN | RED |
| GREEN | GREEN | RED | RED | BLUE |
| RED | BLUE | GREEN | BLUE | GREEN |
| GREEN | GREEN | RED | GREEN | RED |
| RED | RED | BLUE | RED | BLUE |
| BLUE | BLUE | GREEN | BLUE | GREEN |
| RED | RED | RED | GREEN | BLUE |
| BLUE | BLUE | GREEN | BLUE | GREEN |
| GREEN | GREEN | BLUE | RED | RED |
| RED | BLUE | RED | BLUE | BLUE |
| GREEN | GREEN | GREEN | RED | GREEN |
| BLUE | RED | BLUE | GREEN | RED |
| GREEN | GREEN | GREEN | BLUE | BLUE |
| BLUE | RED | RED | GREEN | RED |
| RED | BLUE | BLUE | RED | GREEN |
| GREEN | RED | GREEN | BLUE | BLUE |
| BLUE | GREEN | BLUE | RED | RED |

TOTAL ERRORS _____

(Appendix adopted from Huntzinger, 1989.)

Stroop Color and Word Test, continued

Administration - Color-Word Page

INSTRUCTIONS: THIS PAGE IS SIMILAR TO THE PAGE YOU JUST FINISHED. I WANT YOU TO NAME THE COLOR OF THE INK THE WORDS ARE PRINTED IN, WHILE IGNORING THE WORD THAT IS PRINTED IN EACH ITEM. FOR EXAMPLE (point to the first item of the first/left hand column), THIS IS THE FIRST ITEM: WHAT WOULD YOU SAY? If the subject is correct, go on to the second item. If incorrect, say: NO, THAT IS THE WORD THAT IS SPELLED THERE. I WANT YOU TO SAY THE COLOR OF THE INK THE WORD IS PRINTED IN. NOW WHAT WOULD YOU SAY TO THIS ITEM? (Point to the second item.) WHAT WOULD THE RESPONSE BE TO THIS ITEM? If correct, proceed to practice item three; if incorrect, repeat the instructions outlined above as many times as necessary until the subject understands or it becomes clear that it is impossible to go on. READ OUT LOUD AS QUICKLY AS POSSIBLE AND CONTINUE UNTIL I SAY STOP. ANY QUESTIONS? READY? BEGIN.

DO: Start timing immediately and make note of any errors and the total number of colors correctly named by the end of 45 seconds. Stop subject's reading after 45 seconds has elapsed.

| | | | | | |
|----------|-------|-------|-------|-------|-------|
| ANSWERS: | BLUE | RED | BLUE | GREEN | RED |
| | RED | BLUE | GREEN | RED | BLUE |
| | GREEN | GREEN | RED | BLUE | GREEN |
| | BLUE | RED | BLUE | GREEN | RED |
| | GREEN | GREEN | RED | RED | BLUE |
| | RED | BLUE | GREEN | BLUE | GREEN |
| | GREEN | GREEN | RED | GREEN | RED |
| | RED | RED | BLUE | RED | BLUE |
| | BLUE | BLUE | GREEN | BLUE | GREEN |
| | RED | RED | RED | GREEN | BLUE |
| | BLUE | BLUE | GREEN | BLUE | GREEN |
| | GREEN | GREEN | BLUE | RED | RED |
| | RED | BLUE | RED | BLUE | BLUE |
| | GREEN | GREEN | GREEN | RED | GREEN |
| | BLUE | RED | BLUE | GREEN | RED |
| | GREEN | GREEN | GREEN | BLUE | GREEN |
| | BLUE | RED | RED | GREEN | RED |
| | RED | BLUE | BLUE | RED | GREEN |
| | GREEN | RED | GREEN | BLUE | BLUE |
| | BLUE | GREEN | BLUE | RED | RED |

TOTAL ERRORS _____
(Appendix adopted from Huntzinger, 1989.)

Appendix R

Trail Making Test Part A

Administration - Part A

INSTRUCTIONS: (Sample Test A) HERE (point) YOU SEE THAT THERE ARE NUMBERS WHICH ARE INSIDE OF CIRCLES. WHAT I WANT YOU TO DO IS CONNECT ALL THESE NUMBERS, IN SEQUENTIAL ORDER (FROM 1 TO 8) WITH ONE LINE (WITHOUT RAISING YOUR PENCIL). START HERE AT #1 (point), THEN DRAW A LINE FROM #1 TO #2, AND THEM FROM #2 TO #3 AND SO ON UNTIL YOU GET TO THE END (#8). DO THIS TASK AS QUICKLY AS POSSIBLE. ANY QUESTIONS? READY? BEGIN.

DO: Begin timing as soon as the subject starts attending to the task. Record time in seconds and any sequential errors made. If subject readily completes Sample A correctly, continue with Part A. If the subject has difficulties with the sample, repeat the instructions to the subject and guide the person through the trail. If the subject then succeeds proceed to Part A. If not, repeat the instructions until the subject does succeed or it becomes clear that they cannot perform the task.

INSTRUCTIONS: (Part A) I WANT YOU TO DO THE SAME THING ON THIS PAGE; HOWEVER, THERE ARE JUST MORE NUMBERS. START HERE (at #1) AND DRAW A LINE FROM #1 TO #2, THEN FROM #2 TO #3 AND SO ON (sequentially) UNTIL YOU REACH THE END AT #25 (point). DO THIS AS QUICKLY AS POSSIBLE WITHOUT RAISING YOUR PENCIL. ANY QUESTIONS? READY? BEGIN.

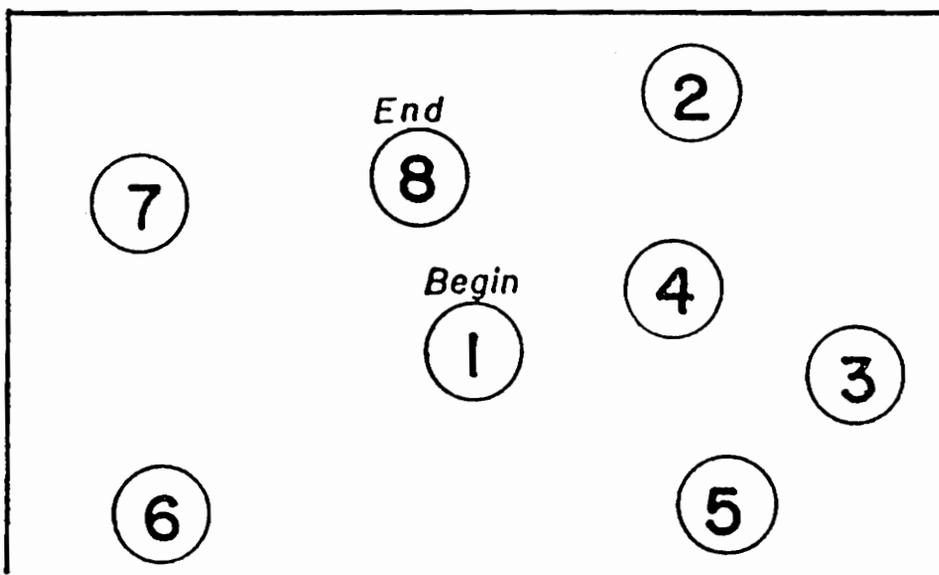
DO: Begin timing as soon as the subject starts attending to the task. Do not correct subject errors. When the subject completes the task, record the time in seconds and any sequencing errors. If the subject does not complete the task in 5 minutes, then discontinue at this point.

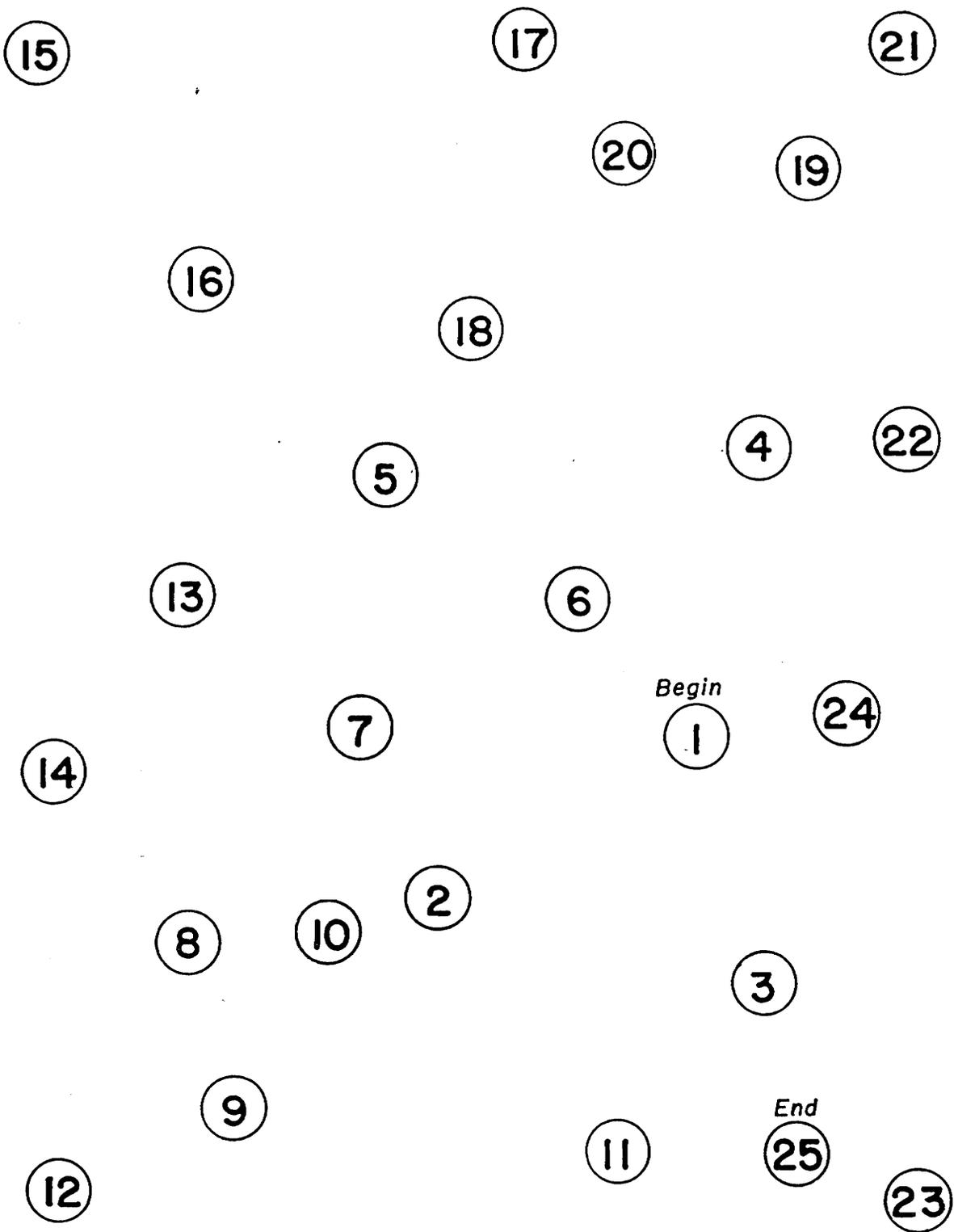
(Appendix adopted from Huntzinger, 1989.)

TRAIL MAKING

Part A

SAMPLE





Trail Making Test Part B

Administration - Part B

INSTRUCTIONS: (Sample Test B) THIS ONE IS A LITTLE DIFFERENT BECAUSE THERE ARE BOTH NUMBERS AND LETTERS. THIS TIME I WANT YOU TO START WITH #1 AND GO TO THE FIRST LETTER "A," THEN TO #2 AND THEN THE SECOND LETTER "B," THEN TO #3 AND THEN THE THIRD LETTER "C" (demonstrate for the subject) AND SO ON UNTIL YOU REACH THE END AT LETTER "D." JUST LIKE YOU COUNT AND SAY THE ALPHABET -- BACK AND FORTH BETWEEN THE TWO. DO IT AS QUICKLY AS YOU CAN. ANY QUESTIONS? READY? BEGIN.

DO: Begin timing as soon as the subject starts attending to the task. Record time in seconds and any sequential errors made. If subject readily completes Sample B correctly, continue with Part B. If the subject has difficulties with the sample, repeat the instructions to the subject and guide the person through the trail. If the subject then succeeds proceed to Part B. If not, repeat the instructions until the subject succeeds or it becomes clear that he/she cannot perform the task.

INSTRUCTIONS: (Part B) I WANT YOU TO DO THE SAME THING ON THIS PAGE. THERE ARE JUST MORE NUMBERS AND LETTERS. START HERE AT #1 AND GO TO THE FIRST LETTER "A," THEN TO #2 AND THEN THE SECOND LETTER "B," THEN TO #3 AND THEN THE THIRD LETTER "C" (demonstrate for the subject) AND SO ON UNTIL YOU REACH THE END (point) AT #13. FIRST GO TO A NUMBER AND THEN THE CORRESPONDING LETTER. DO IT AS QUICKLY AS YOU CAN. ANY QUESTIONS? READY? BEGIN.

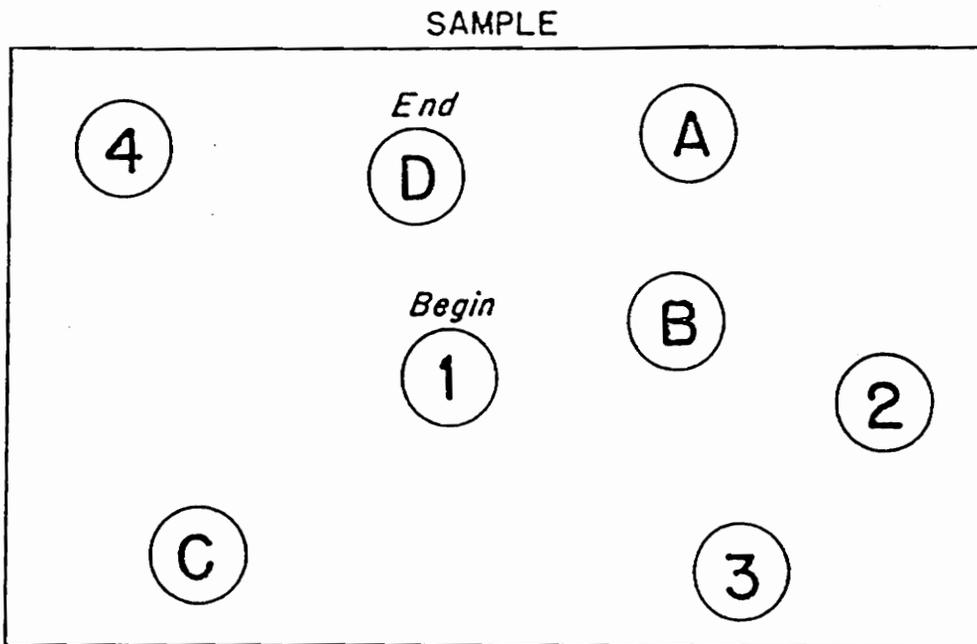
DO: Begin timing as soon as the subject starts attending to the task. Record the time in seconds and errors in parentheses. Do not correct subject errors.

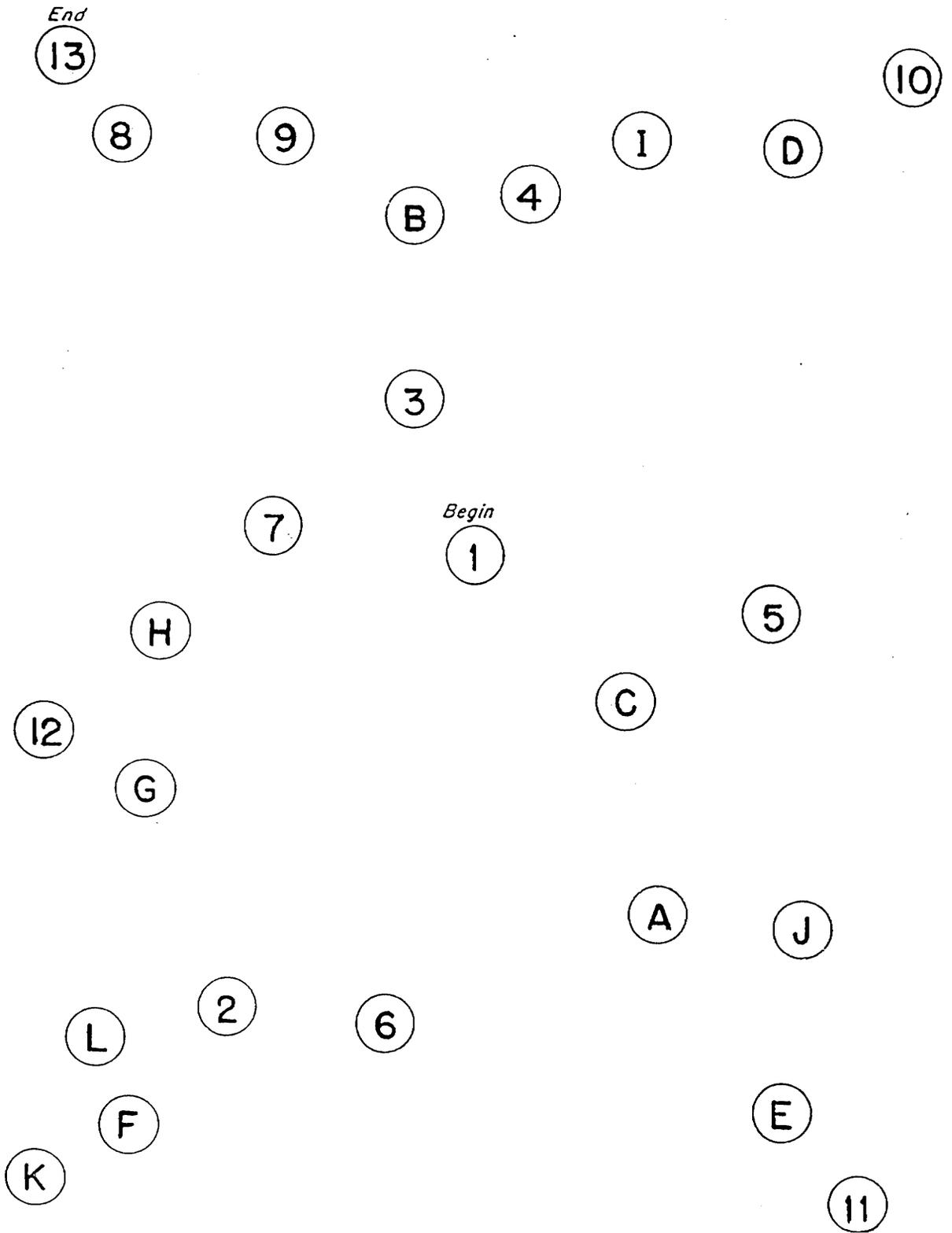
If the subject does not complete the task within 5 minutes, discontinue at that point.

(Appendix adopted from Huntzinger, 1989.)

TRAIL MAKING

Part B





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PROFESSIONAL PRESENTATIONS

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- Ellis, C. R., Crews, Jr., W. D., & Bonaventura, S. The correlation between the DST and depression in persons with mental retardation. Paper presented at the Second Annual Commonwealth Institute for Child and Family Studies Conference, October, 1992.
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- Crews, Jr., W. D. & Harrison, D. W., Cerebral asymmetry in facial affect perception of women: Neuropsychological effects of depression. Paper presented at the Thirteenth Annual National Academy of Neuropsychology Meeting, October, 1993.
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- Crews, Jr., W. D., Harrison, D. W., Rhodes, R. D., & Demaree, H. A., Hand fatigue asymmetry in the motor performances of women with depressed mood. (Paper presented at the Virginia Psychological Association, Spring Convention, April, 1995.)

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RESEARCH IN PROGRESS

Crews, Jr., W. D., Harrison, D. W., Rhodes, R. D., & Demaree, H. A., Visual affect perception in women with depressed mood.

Crews, Jr., W. D., & Barth, J. T., Longitudinal neuropsychological evaluation of a case of pineal tumor occurring in an adolescent female.

Singh, N. N., Ellis, C. R., Goza A, A. B., Ricketts, R. W., Bonaventura, S., & Crews, Jr., W. D., Validation of the depression checklist for individuals with mental retardation.

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EDITORIAL EXPERIENCE

Guest Reviewer, Research in Developmental Disabilities (1992).

Guest Reviewer, Archives of Clinical Neuropsychology (1994).

Guest Reviewer, Journal of Head Trauma Rehabilitation (1994).

PROFESSIONAL AFFILIATIONS

Association for Advancement of Behavior Therapy (Student Member)

American Association of Spinal Cord Injury Psychologists and Social Workers (Associate Member)

American Association on Mental Retardation (Student Member)

American Psychological Association (Student Affiliate)

American Psychological Association, Division 38, Health Psychology (Student Member)

American Psychological Association, Division 40, Neuropsychology (Student Member)

American Psychological Society (Student Member)

National Academy of Neuropsychology (Student Member)
Southeastern Psychological Association (Member)
Virginia Psychological Association (Student Member)

HONORS AND AWARDS

Phi Sigma Pi National Honor Fraternity (Member)
Sigma Xi, The Scientific Research Society (Member)
The Gamma Beta Phi Society (Member)
The Honor Society of Phi Kappa Phi (Member)



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