Neuropsychological Test Performances of Young Depressed Outpatient Women: An Examination of Executive Functions

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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, Hand Dynamometer tasks of grip strength, perseveration, and fatigue, the FAS Verbal Fluency Test, the Stroop Color and Word Test, and the Trail Making Test (Parts A and B). 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. © 1999 National Academy of Neuropsychology. Published by Elsevier Science Ltd

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). Goldstein (1939) first reported a high incidence of a “catastrophic reaction” in patients with lesions to the left hemisphere (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).

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.

A diversity of research involving electroencephalography (EEG), regional cerebral blood flow (rCBF), single photon emission tomography (SPECT), and positron emission tomography (PET) has demonstrated hemispheric asymmetries in depressed individuals who have no history of brain lesions. 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.

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). 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 also been used to examine hemispheric asymmetries in depressives. For example, Delvenne et al. (1990) examined rCBF of major depressives and controls using single photon 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 (and neural hypoactivity) of the LH (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. also found that a cognitively impaired depressed group, versus a nonimpaired depressed group, displayed decreased rCBF in the left anterior medial prefrontal cortex. This finding suggests that cognitively impaired depressives may have somewhat different cortical abnormalities than nonimpaired depressives. Taken together, these PET studies lend support to the hypothesis of left frontal dysfunction/hypoactivation in depression.

Intimately related to the neurophysiology 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
Executive Functions in Depression

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), the Wisconsin Card Sorting Test (Martin, Oren, & Boone, 1991), and measures of verbal fluency (Beatty, Wonderlich, Staton, & Ternes, 1990; Hart, Kwentus, Taylor, & Harkins, 1987). Such measures have been suggested to be most sensitive to anterior cerebrum dysfunction, especially of the left frontal region (see Kolb & Whishaw, 1990; Lezak, 1995). Additionally, depressives have displayed significant deficits on the Left Hemisphere Laterality 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 also 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.) as well as their hand dynamometer performances (Cohen et al.). 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.).

In sum, depressed individuals may exhibit a wide diversity of neuropsychological deficits. However, due to the failure of many studies to precisely identify their samples; use consistent methodology and control groups; as well as the inclusion of subjects of different ages, genders, and depression subtypes, it remains unclear if there are specific patterns of neuropsychological/executive function deficits associated with specific subtypes of depression (Cassens, Wolfe, & Zola, 1990; McAllister, 1981; Miller, 1975). Furthermore, Cassens et al., 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.

Based on the left/right anterior cerebral asymmetries that have been 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). It was hypothesized that depressed women (vs. 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. In contrast, because 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, 1988) and who also scored within the depressed range on the Beck Depression Inventory \( M = 27.93, SD = 7.79; \) Beck, 1972). 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 \( M = 2.50, SD = 2.37; \) Beck, 1972). Nondepressed women were selected (i.e., matched) to approximate the ages and intellectual levels of the depressive group.

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 (e.g., 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). The criterion for right-hand dominance and inclusion in the study was a score of +6 or more.

Depressive disorders were evaluated using two separate classification instruments. Sections of the Anxiety Disorders Interview Schedule-Revised (ADIS-R; DiNardo & Barlow, 1988) that assess depressive disorders were used for classification purposes. The Beck Depression Inventory (Beck, 1972) was also administered, with scores of 0–9 (BDI normal range; Beck, 1972) being necessary for inclusion in the nondepressed group, while scores above 16 (BDI mild-moderate depression; Beck, 1972) were required for the depressed group.

Anxiety was assessed using the validated self-report State-Trait Anxiety Inventory (Spielberger, 1983). This inventory was not used as a criterion measure for inclusion in this study.

Two Wechsler Adult Intelligence Scale-Revised (WAIS-R; Wechsler, 1981) subtests (i.e., Vocabulary and Block Design) were also administered 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.

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 senior author. Upon arrival, a 5-minute, rapport-building session was conducted during which time the purpose of the study was explained and informed consent obtained. 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), and a brief history questionnaire. Women who reported significant difficulties on the history questionnaire were debriefed and excused.
Next, sections of the ADIS-R (DiNardo & Barlow, 1988) were administered to assess for depressive disorders. Also at this time, the WAIS-R subtests were administered to obtain IQ estimates.

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 (Jones-Gotman & Milner, 1977), Hand Dynamometer Tests of Grip Strength, Perseveration and Fatigue (Crews & Harrison, 1994b; Dodrill, 1978; Harrison & Pauly, 1990; Huntzinger, 1989), FAS Test (Borkowski, Benton, & Spreen, 1967), Stroop Color and Word Test (Stroop, 1935; also see Golden, 1978), and the Trail Making Test (Parts A and B; Reitan, 1979; Reitan & Wolfson, 1993). Order of test administration was determined via a Latin square design to control for potential practice and fatigue effects.

The test protocol for the Dynamometer tests was as follows. Full hand grip strength was assessed on the first trial, with the subjects squeezing the device as hard as possible. A second trial with the same hand immediately followed that required subjects to squeeze only half as hard to obtain a measure of perseveration. Subjects were then required to squeeze the dynamometer as hard as possible five times in rapid succession to assess motor fatigue. The device was reset after all trials and the instrument’s scale was always turned away from subjects. Hand order for the dynamometer testing was alternated across subjects. Upon completion of all testing, subjects were debriefed and excused.

RESULTS

Descriptive Measures

Separate analyses of variance (ANOVAs) were conducted for age in years, educational level in years, handedness scale scores, State-Trait Anxiety Inventory (STAI) State and Trait anxiety scores, and the WAIS-R Vocabulary and Block Design subtests scaled scores. Only the scores for the STAI differed significantly between groups. Table 1 provides a summary of the group means and standard deviations for each measure.

Neuropsychological Tests

Table 2 provides an overall summary of the group means and standard deviations for each neuropsychological measure. To examine any significant intra-test differences be-

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Group Means and Standard Deviations for the Descriptive Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>Depressed</td>
</tr>
<tr>
<td>Age (in years)</td>
<td>20.33</td>
</tr>
<tr>
<td>Educational level (in years)</td>
<td>14.37</td>
</tr>
<tr>
<td>Handedness Scale scores</td>
<td>10.37</td>
</tr>
<tr>
<td>State Trait Anxiety Inventory State Anxiety scores</td>
<td>49.77</td>
</tr>
<tr>
<td>State Trait Anxiety Inventory Trait Anxiety scores</td>
<td>62.37</td>
</tr>
<tr>
<td>WAIS-R Vocabulary scaled scores</td>
<td>13.43</td>
</tr>
<tr>
<td>WAIS-R Block Design scaled scores</td>
<td>12.53</td>
</tr>
</tbody>
</table>

* \( p < .0001 \).
between the depressed and nondepressed groups, independent ANOVAs were performed for each neuropsychological test and measure. A Bonferroni-corrected alpha level (Winer, 1971; 0.05/21 = .002) was used to correct for multiple comparisons. All post hoc, pairwise comparisons of the means were made using Tukey’s Studentized Range Test.

For the Design Fluency Test, a two-factor, mixed design 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, $F(1, 58) = 32.65, p < .0001$. Specifically, women tended to generate significantly more novel drawings during the free condition as compared to the fixed condition.

For the hand dynamometer measures, separate ANOVAs were conducted for the full hand grip strength, perseveration, and fatigue data.

For the full-hand grip strength (in kg) data, a two-factor, mixed design 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, $F(1, 58) = 32.48, p < .0001$. 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 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 (Crews & Harrison, 1994b; Harrison & Pauly, 1994).

### TABLE 2
Neuropsychological Test Group Means and Standard Deviations

<table>
<thead>
<tr>
<th>Variable</th>
<th>Depressed</th>
<th>Nondepressed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
</tr>
<tr>
<td><strong>Design Fluency Test (designs generated):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Free novel output</td>
<td>32.23</td>
<td>10.98</td>
</tr>
<tr>
<td>Fixed novel output</td>
<td>26.53</td>
<td>8.56</td>
</tr>
<tr>
<td><strong>Dynamometer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full grip strength (in kg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right hand</td>
<td>30.80</td>
<td>4.23</td>
</tr>
<tr>
<td>Left hand</td>
<td>28.13</td>
<td>4.33</td>
</tr>
<tr>
<td>Percent Change Scores (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right hand</td>
<td>42.79</td>
<td>15.60</td>
</tr>
<tr>
<td>Left hand</td>
<td>45.55</td>
<td>20.29</td>
</tr>
<tr>
<td>Fatigue Scores (in kg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right hand</td>
<td>2.93</td>
<td>1.85</td>
</tr>
<tr>
<td>Left hand</td>
<td>3.43</td>
<td>2.31</td>
</tr>
<tr>
<td><strong>FAS Test (words generated):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trial 1, “F” words</td>
<td>14.00</td>
<td>3.76</td>
</tr>
<tr>
<td>Trial 2, “A” words</td>
<td>11.83</td>
<td>3.33</td>
</tr>
<tr>
<td>Trial 3, “S” words</td>
<td>15.73</td>
<td>3.53</td>
</tr>
<tr>
<td>Total words</td>
<td>41.57</td>
<td>9.06</td>
</tr>
<tr>
<td><strong>Stroop Color and Word Test (items named/read):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word page</td>
<td>110.83</td>
<td>17.26</td>
</tr>
<tr>
<td>Color page</td>
<td>82.53</td>
<td>13.22</td>
</tr>
<tr>
<td>Color-word page</td>
<td>47.97</td>
<td>9.03</td>
</tr>
<tr>
<td><strong>Trail Making Test</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part “A” time (in sec)</td>
<td>23.07</td>
<td>6.78</td>
</tr>
<tr>
<td>Part “B” time (in sec)</td>
<td>51.63</td>
<td>17.99</td>
</tr>
</tbody>
</table>

*Note. No significant differences found between groups on any of the above variables.*
The “percent-change” scores for each hand were generated using the following formula (Equation 1):

\[ \text{% Change} = \frac{\text{Hard} - \text{Half}}{\text{Hard}} \times 100 \] (1)

If the percent-change score equaled 50, the hard to half-as-hard score was perfect (Huntzinger, 1989). A score less than 50 reflected an inaccurate, perseverative 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 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., \( p < .002 \)) was used, none of the fatigue score analyses were significant.

For the FAS Verbal Fluency Test, a two-factor, mixed design 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, \( F(2, 116) = 31.14, p < .0001 \). 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 Stroop Color and Word Test, a two-factor, mixed design 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, \( F(2, 116) = 1053.24, p < .0001 \). 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 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, \( F(1, 58) = 246.90, p < .0001 \). Specifically, women 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 a self-report inventory and structured clinical interview) 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.

Despite a priori hypotheses, the present research failed to identify any 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 the hand dynamometer (i.e., grip strength; Cohen et al., 1982; Rosofsky, Levin, & Holzman, 1982), verbal fluency tests (Johnson & Crockett, 1982; Wolfe,
Granholm, Butters, Saunders, & Janowsky, 1987), the Stroop Test (Rush et al., 1983), Trail Making Test (Rush et al., 1983), card sorting tests (Hart, Kwentus, Taylor, & Harrison, 1987; Loeb, Beck, & Diggory, 1971), and the Category Test (Gray, Dean, Rattan, & Cramer, 1987).

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 consistent methods (e.g., control groups, sample sizes), as well as the inclusion of subjects of diverse ages, genders, and depressive subtypes (Cassens et al., 1990; McAllister, 1981; Miller, Faustman, Moses, & Csernansky, 1991; Miller, 1975; Sweet, Newman, & Bell, 1992). Furthermore, the overwhelming majority of these test performance studies 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., possibly 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 et al., 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.

The typical profile of the depressed group utilized in the present study appeared to differ significantly from depressed patients employed in previous studies which have demonstrated impaired neuropsychological test performances (for reviews, see Cassens et al., 1990; McAllister, 1981; Miller et al., 1991; Miller, 1975; Sweet et al., 1992). One of the primary ways depressed subjects in this study differed from the majority of past 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, 1988) and DSM-IV (American Psychiatric Association, 1994) criteria for major depression, they typically were only moderately depressed. This is in contrast to assessment studies which have examined severely depressed patients (e.g., Abrams & Taylor, 1987; Cornell et al., 1984; Frith et al., 1983; Shipley et al., 1981; see also Hartlage et al., 1993, and Miller, 1975, for reviews), and other studies where inpatients were used, but depression severity was not mentioned (for reviews, see Cassens et al.; Hartlage et al.; McAllister, 1981). 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 neuropsychologi-
cal test impairment (for reviews, see Miller, 1975; Newman & Sweet, 1992), the depressions of the women in the present study may not have been of sufficient severity to result in significant neurocognitive deficits.

Relatively, 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 to participate, as well as possibly help-seeking behaviors. Clinically, it also appeared that the women were interested in the assessment process and, overall, 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/interest exhibited by the depressed sample in this study helped to offset any neuropsychological impairments which may have otherwise been observed.

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).

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., $M_s = 29.2$ and 28.5 years, respectively). The findings from these past studies are not directly comparable to the present results due to the heterogeneity of ages and utilization of older samples. Relatively, since the depressed women in the present study were relatively young, they typically did not have extensive histories of multiple/recurrent depressions. It seems reason-
able then, 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).

The depressed women, versus the nondepressed, 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, whereas 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 both temporary, situational, state anxiety as well as high levels of relatively stable, long-lasting, anxiety proneness (trait anxiety; Spielberger, 1983). These findings were not unexpected as elevated levels of anxiety are often an associated feature of depression (American Psychiatric Association, 1994) and also paralleled previous empirical findings (Crews & Harrison, 1994a, 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 interacted synergistically to produce the present findings.

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 de-
pression. Furthermore, as the anterior cerebral regions (especially the left) appear to be relatively intact neuropsychologically in such depressed women, these individuals may be good candidates for talk therapies (e.g., cognitive therapy) which utilize and focus 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 be made more readily. 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.

REFERENCES


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