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Neurocognitive Performance Among Alcohol Dependent Men With and Without Physical Violence Toward Their Partners: A Preliminary Report

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Abstract: Objective: There are high rates of co-occurring alcohol dependence and intimate partner violence (IPV) among men seeking substance abuse treatment. The authors examined neurocognitive performance among treatment-seeking alcohol dependent men with (IPV+) and without reported physical violence (IPV−). Method: Twenty-five subjects participated in this pilot study. All participants underwent a neurocognitive battery including, Continuous Performance Test (CPT), California Verbal Learning Test (CVLT), Digit Span, Iowa Gambling Test (IGT), Wisconsin Card Sort (WCST), Trail Making Test, Parts A & B, a visuospatial memory (VSWM) task and the Stroop Color Word Test (SCWT). Result: Alcohol dependent participants with IPV (IPV+; n = 9) had more severe deficits in attention, concentration, cognitive flexibility compared to controls (n = 7). Both the alcohol dependent (IPV−; n = 9) and IPV+ groups had significantly more impairments on tasks of impulsivity than the smoking controls. The IPV− group had significantly more impairments on executive functioning compared to smoking controls, but was not significantly different than the IPV+ group. Conclusions: Our preliminary results suggests that IPV+ males have more severe neuropsychological impairments compared to the
smoking control group than did the IPV− group. The implications of these findings are discussed.

**Keywords:** Alcohol dependence, men, neurocognitive performance, physical violence

**INTRODUCTION**

Intimate partner violence (IPV) is common and constitutes a significant public health concern. Alcohol use is involved in 40–60% of incidents of IPV (1–5). Male alcohol dependent patients seeking treatment have prevalence rates of physical violence as high as 50–60% in the year prior to substance abuse treatment (4–6). Accordingly, male offenders of IPV who are entering substance abuse treatment are a high-risk group for violence, substance abuse, and IPV relapse. It has also been postulated that alcohol use exacerbates violence, which may be mediated through the psychopharmacologic effects of alcohol on cognitive processing (4, 7). In fact, recent studies suggest a strong relationship between alcohol use, physical violence, and cognitive functioning. For example, alcohol use has been linked to deficits in impulse control that are correlated with violent behaviors (8, 9).

To date, few studies have examined differences in cognitive functioning between alcohol dependent individuals with and without IPV. Little is known about the association of alcohol use and physical violence with cognitive performance. Heavy alcohol use has been linked to increases in cognitive deficits (10). Moreover, a substantial percentage of persons diagnosed with alcohol abuse disorders exhibit impairments on neuropsychological tests such as attention and concentration, cognitive flexibility, working memory, executive functioning, and verbal ability (11). Other studies suggest a relationship between aggressive behavior and neurocognitive performance. For example, research has shown that individuals who exhibit aggression also show neurocognitive decrements (12–14). More specifically, patients who have problems with anger and aggression display reduced prefrontal cortical inhibition. That is, aggressive individuals show impairments on prefrontal tasks such as the Wisconsin Card Sorting Test (WCST) and visuospatial working memory (VSWM) tasks (12–13). Understanding the specific neurocognitive deficits among alcohol-dependent patients with and without physical violence may thus lead to more effective treatments.

In this pilot study, we hypothesized that alcohol-dependent men with physical violence (IPV+) would have greater impairments than
alcohol-dependent men without physical violence (IPV−), while the smoking controls would have the least impairment.

**METHOD**

Subjects were 25 cigarette smoking male patients ages 18–55, meeting DSM-IV criteria for nicotine dependence. Seventeen subjects in the IPV+ (n = 9) and IPV− (n = 9) groups met DSM-IV criteria for alcohol dependence, while controls (n = 7) were not alcohol dependent. Subjects were recruited at the Connecticut Mental Health Center (CMHC) and were seeking treatment. The three groups included the following: 1) males with alcohol dependence and physical violence toward their partner (IPV+; n = 9); 2) males with alcohol dependence without physical violence (IPV−; n = 9); and 3) male smoking controls (n = 7). Alcohol dependence was determined by SCID for DSM-IV (15), while physical violence (e.g., pushing, shoving, slapping, hair pulling, punching, sexual assault) was measured by the Conflict Tactic Scale-2 (16) and arrests for family violence. Participants reported not using alcohol within the 14 days prior to testing. All urine toxicology screens were negative for drug use prior to testing. *Subjects were excluded if they met DSM-IV psychiatric classifications for lifetime schizophrenia or bipolar disorder, exhibited significant current suicidal or homicidal plans, or had used alcohol within the two weeks prior to the neurocognitive assessment. Recruited subjects were in early abstinence, and measures of Clinical Institute Withdrawal for Alcohol scale (CIWA-AD) (17) were given to rule out any withdrawal related symptoms that could also contribute as a confounding variable on neurocognitive tests.*

**Neurocognitive Assessments**

A neuropsychological battery, administered under the supervision of the study neuropsychologist, was comprised of the following tests: 1) WCST, a computerized measure of prefrontal cortical executive function (18); 2) VSWM, a computerized test of spatial working memory (19–21); 3) the Stroop Color Word Test (SCWT), a computerized measure of processing speed and response inhibition (22); 4) Continuous Performance Test (CPT), a computerized measure of sustained attention, concentration, and impulsivity (23); 5) Trail Making Test Part A (measures visual motor sequencing) and Trail Making Test Part B, a measure of cognitive flexibility; 6) California Verbal Learning Test (CVLT), a paper and pencil measure of verbal learning and memory (24); 7) the Iowa Gambling Task (IGT), a computerized measure of impulsivity and...
adaptability to feedback (25); and 8) the Shipley IQ Test (baseline only), a computerized general measure of intellectual functioning (26).

**Data Analysis**

Our primary data analytic strategy for continuous measures was Analysis of Variance measures (ANOVAs), with post-hoc testing using Bonferroni comparisons. Categorical measures were conducted via chi square analysis. Significance was assumed at $p < .05$.

**RESULTS**

The participants had a mean age of 40 (SD = 9.9) with the following racial composition: 61% were Caucasian, 35% were African American, and 4% were Hispanic. The sample had a mean of 13.1 (SD = 2.6) years of education. The participants smoked a mean of 16.2 (SD = 7.4) cigarettes per day with a range of 13.1 to 19.6. Participants had a mean range of intellectual functioning of 95.6 (SD = 13.0). The mean Beck Depression Inventory (BDI) score was 5.2 (SD = 4.4) with a mean Brief Psychiatric Rating Score (BPRS) of 19.9 (SD = 8.6). There were no significant differences between groups across demographic characteristics (e.g., age, race, cigarettes per day, CO levels, or years of education). There were significant differences between the groups across psychiatric severity [BPRS; $F(1,23) = 11.8$, $p < .000$], with the alcohol dependent violent participants showing the most impairments. There were no significant differences between groups on depression scores [$F(1,23) = 1.8$, $p < .2$].

Comparison of group neuropsychological performance (Table 1) showed that the IPV+ group had significantly more impairment in IQ [$F(1,23) = 4.8$, $p < .02$], visual motor tracking (e.g., Trails A), $F(1,23) = 4.1$, $p < 0.03$], cognitive shifting [e.g., Trails B; $F(1,23) = 5.9$, $p < .01$] and impulsivity [e.g., IGT; $F(1,23) = 6.3$, $p < .008$] compared to the smoking controls. However, both the IPV+ and IPV− groups had significantly more impairments than the smoking controls on the IGT. An interesting finding was that the IPV− group had significantly more impairments on percentage of non-perseverative errors on WCST, [$F(1,23) = 4.2$, $p < .03$], and a strong trend toward greater impairment on WCST Categories Completion [$F(1,23) = 3.0$, $p < .07$] and % perseverative errors [$F(1,23) = 3.2$, $p < .06$] compared to the smoking controls; there was no significant difference between the IPV+ and IPV− groups. Moreover, both the IPV+ and smoking controls had significantly more impairments on a working memory task [e.g., digits backwards; $F(1,23) = 3.8$, $p < 0.04$] compared to the IPV− group.
Table 1. Differences in neurocognitive functioning across experimental groups

<table>
<thead>
<tr>
<th></th>
<th>IPV+ (n = 9) Mean ± sd</th>
<th>IPV− (n = 9) Mean ± sd</th>
<th>Controls (n = 7) Mean ± sd</th>
<th>ANOVA F, p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IQ</strong></td>
<td></td>
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<tr>
<td>Shipley</td>
<td>86.6 ± 11.3</td>
<td>101.7 ± 12.8</td>
<td>101.0 ± 8.1</td>
<td><strong>4.8, .02</strong></td>
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<tr>
<td><strong>Attention/Impulsivity</strong></td>
<td></td>
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<tr>
<td>CPT D’ (attentiveness)</td>
<td>2.8 ± .8</td>
<td>2.5 ± .77</td>
<td>2.8 ± .80</td>
<td><strong>.39, .68</strong></td>
</tr>
<tr>
<td>CPT hit rate</td>
<td>385.9 ± 75.0</td>
<td>310.8 ± 134.3</td>
<td>330.6 ± 75.8</td>
<td>1.3, .3</td>
</tr>
<tr>
<td>CPT commission errors</td>
<td>25.9 ± 21.3</td>
<td>36.1 ± 27.5</td>
<td>33.8 ± 15.9</td>
<td><strong>.47, .6</strong></td>
</tr>
<tr>
<td>Trails A (seconds)</td>
<td>33.38 ± 12</td>
<td>28.3 ± 8.3</td>
<td>19.3 ± 4.2</td>
<td><strong>4.1, .03</strong></td>
</tr>
<tr>
<td>Digit Span Forward</td>
<td>8.5 ± 3.1</td>
<td>10.7 ± 1.8</td>
<td>11.3 ± 3.0</td>
<td>2.3, .13</td>
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<tr>
<td><strong>Working memory</strong></td>
<td></td>
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<tr>
<td>Digit Span Backwards</td>
<td>5.9 ± 1.4</td>
<td>8.00 ± 2.5</td>
<td>5.5 ± .5</td>
<td><strong>3.8, .04</strong></td>
</tr>
<tr>
<td>Visuospatial memory 60 sec. delay</td>
<td>1.8 ± 1.4</td>
<td>1.3 ± .75</td>
<td>1.4 ± .69</td>
<td>.58, .57</td>
</tr>
<tr>
<td>Visuospatial memory 30 sec. delay</td>
<td>2.0 ± 1.6</td>
<td>1.3 ± .54</td>
<td>1.0 ± .46</td>
<td>.45, .65</td>
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<tr>
<td><strong>Response inhibition</strong></td>
<td></td>
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<tr>
<td>Stroop Interference (msec.)</td>
<td>440 ± 863</td>
<td>837 ± 1181</td>
<td>563 ± 325</td>
<td>.36, .70</td>
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<tr>
<td><strong>Verbal memory</strong></td>
<td></td>
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<td>CVLT (total score)</td>
<td>47.9 ± 6.7</td>
<td>50.1 ± 10.6</td>
<td>43.3 ± 12.7</td>
<td>.83, .452</td>
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<tr>
<td>Trials 1–5, Recog.-Discrim., Delayed Recall</td>
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<td><strong>Executive functioning</strong></td>
<td></td>
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<tr>
<td>WCST % Errors</td>
<td>23.4 ± 8.3</td>
<td>37.6 ± 19.4</td>
<td>18.8 ± 6.1</td>
<td><strong>4.2, .03</strong></td>
</tr>
<tr>
<td>WCST % Perseverative Errors</td>
<td>11.44 ± 3.8</td>
<td>16.5 ± 8.5</td>
<td>9.33 ± 3.1</td>
<td><strong>3.2, .06</strong></td>
</tr>
<tr>
<td>Categories Completed (CC)</td>
<td>5.33 ± 1.4</td>
<td>4.13 ± 1.7</td>
<td>5.83 ± .41</td>
<td><strong>3.0, .07</strong></td>
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<tr>
<td><strong>Cognitive flexibility</strong></td>
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<tr>
<td>Trails B (seconds)</td>
<td>94.9 ± 25.8</td>
<td>69.6 ± 32.1</td>
<td>50.1 ± 5.7</td>
<td><strong>5.9, .01</strong></td>
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<td><strong>Impulsivity</strong></td>
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<tr>
<td>IGT</td>
<td>-7.33 ± 9.07</td>
<td>-5.33 ± 21</td>
<td>22.0 ± 6.09</td>
<td><strong>6.3, .008</strong></td>
</tr>
</tbody>
</table>

Note: Bolded values indicate significant differences between groups as described in the results section.
There were no significant differences between groups on VSWM, processing speed or response inhibition (e.g., SCWT) or verbal learning and memory (Table 1). Pearson’s correlations were performed between BPRS and cognitive measures. For example, there were no significant correlations between BPRS and the following cognitive measures: Trails A \[ r = -0.17, p < 0.45 \], Digit Span Backwards \[ r = 0.26, p < 0.25 \], WCST % errors \[ r = 0.16, p < 0.48 \], WCST % Perseverative errors \[ r = 0.17, P = 0.44 \], or Categories completed \[ r = -0.25, p < 0.26 \], Trails B \[ r = 0.43, p < 0.056 \], or the IGT \[ r = -0.15, p < 0.51 \]. Moreover, IQ was used as a covariate between groups and this did not alter neuropsychological differences.

DISCUSSION

We examined neurocognitive differences between alcohol dependent men with (IPV+) and without (IPV-) physical violence toward their partners and compared these groups to smoking controls without either alcohol dependence or IPV histories. Compared to smoking controls, subjects in the IPV+ group had lower IQ and significantly more impairments on impulsive control, visuomotor sequencing-attention tasks, and cognitive flexibility. The IPV- group had significantly more impairments on executive functioning compared to the smoking controls but did not differ from the IPV+ group. Both IPV groups had significantly more impairments on impulsive control than did the smoking controls, with the IPV+ group displaying the most severe impairments of the three groups.

The general finding that the IPV+ group had more impairments than smoking controls on visuomotor sequencing-attention tasks, cognitive flexibility, and impulsive control may relate to their lower IQ. However, we did covary for IQ between the groups and found that the IPV+ group continued to have significant impairments in attention, cognitive flexibility, and impulsive control compared to the smoking control group, suggesting that the interactive effects of alcohol and violence expression may be associated with more severe cognitive dysfunction. There was no significant difference between the IPV+ and IPV- groups across visuomotor sequencing-attention tasks or cognitive flexibility.

The finding that only the IPV- group had more impairments in prefrontal functioning (WCST) compared to smoking controls did not support our hypotheses. We speculate that although both groups were comparable on their current severity of alcohol dependence, we did not have reliable information regarding their ages of onset for heavy alcohol use. It has been found that there is an inverse relationship between age of onset for heavy alcohol use and performance on neurocognitive tests (10)
of prefrontal cognitive functioning. In the present study, there was no significant difference between the IPV+ group and the IPV− group across executive functioning.

Accordingly, this is one of the first studies to conduct a neurocognitive assessment of alcohol dependent males with and without physical IPV. Such findings may aid in the development of targeted behavioral and/or pharmacological interventions for co-morbid IPV and alcoholism, which constitute a significant public health problem in the United States, with a large burden on families and the court system (27, 28). Future studies are needed with larger sample sizes of participants, more sensitive measures of prefrontal cortical functioning, and more detailed information regarding amount (ounces), type (liquor, beer, wine), and age of onset of alcohol use (early vs. late onset of heavy use).

REFERENCES
