Poor impulse control and heightened attraction to alcohol-related imagery in repeat 
DUI offenders

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Abstract

Background
Research suggests that DUI offenders have an increased prevalence of alcohol abuse and higher levels of impulsivity compared with drivers with no history of DUI. However, reports linking alcohol consumption, impulsivity, and DUI offenses are primarily based on self-reports and fail to identify specific behavioral and cognitive mechanisms that might underlie impulsivity and contribute to the recidivism of drinking and driving offenses.

Aims
This study directly assessed inhibitory control and attention to alcohol-related images in first-time versus recidivist DUI offenders.

Methods
Three groups of subjects participated in the study: repeat DUI offenders (those with two or more DUls within a five year period), first-time-DUI offenders, and control drivers with no history of a DUI offense. Subjects performed a visual probe task that measured their attention toward alcohol-related images and a go/no-go task that assessed their inhibitory control.

Results
There were no differences in the quantity or frequency of drinking among the three groups. Repeat offenders reported more alcohol-related problems, greater cognitive preoccupation with alcohol and higher trait impulsivity compared with the other drivers. Repeat offenders also displayed greater attention toward alcohol-related cues and poorer inhibitory control compared with first-time offenders and drivers with no history of DUI. By contrast, first-time offenders did not differ from non-offenders in inhibitory control, attention to alcohol, cognitive preoccupation with alcohol, or trait impulsivity.

Discussion and Conclusions
Findings from this laboratory study highlight potentially important differences in cognitive and behavioral mechanisms between recidivist DUI offenders and first-time offenders. The results indicate that deficits in inhibitory control and attentional bias toward alcohol may underlie the heightened levels of impulsivity commonly self-reported by DUI offenders. Moreover, attentional bias to alcohol and poor inhibitory control might be especially characteristic of repeat offenders and possibly undermine treatment and prevention efforts in this population.

Introduction
Alcohol-related traffic fatality and injury are a major public health problem. According to the National Highway Traffic Safety Administration, approximately 30% of all fatal crashes in North America are related to alcohol (NTSA, 2012). Unfortunately, efforts aimed at reducing the incidence of driving under the influence (DUI) have only been modestly effective. In fact, over one third of individuals who are convicted of DUI are repeat offenders, highlighting the difficulty of treating DUI offenders and, more specifically, re-offenders (Nochajski & Stasiewicz, 2006). The issue of driving while intoxicated has primarily been considered a problem related to alcohol abuse and dependence. As such, many DUI programs are aimed at addressing heavy consumption. However, many DUI offenders, and specifically younger offenders do not typically meet DSM criteria for alcohol abuse or dependence (Lapham et al., 2004; NHTSA, 2011). Thus, it is likely that there are additional factors beyond dependence-level consumption that contribute to the propensity to drink and drive.

Lack of evidence for alcohol dependence among younger DUI offenders reflects the emerging view that DUI is not merely a function of heavy consumption, but reflects deficient behavioral regulation and reward sensitivity (Ryb et al., 2006). DUI offenders self-report traits of impulsivity. One particular component of impulsivity concerns inhibitory control, or, the ability to inhibit pre-potent behaviors. Laboratory studies use reaction time models such as stop-signal and cued go/no-go tasks that measure the ability to inhibit action (e.g., Fillmore, 2003). Such “stop processes” are imperative for inhibiting inappropriate or maladaptive behaviors. As such, deficits in inhibitory control might be an especially important factor contributing to DUI because drinkers are unable to stop themselves from getting into a car and driving after consuming alcohol.

Along with deficient inhibitory control, heightened appetitive processes might also be an important process that underlies the propensity to drink and drive. Evidence that alcohol-related images can elicit reactions reliably in drinkers has led to studies aimed at testing the possibility that such cues actually come to dominate the drinker’s attention. Laboratory studies have begun employing eye tracking technology to directly assess the degree to which drinkers attend to alcohol versus neutral-related stimuli. Attentional bias is observed by greater amounts of time spent visually attending to alcohol images compared with neutral images. It is posited that heightened attentional bias reflects motivation to consume alcohol, and greater attentional bias has been shown for heavier compared with lighter drinkers (Miller & Fillmore, 2011). Therefore, individuals who display a significant degree of attentional bias to the alcohol cues they encounter in their environment might be motivated to drink in situations in which they did not originally intend to, such as those in which they might need to drive.

Taken together, there is evidence to suggest that poor stop processes coupled with heightened attentional bias might result in an increased incidence of drinking and driving behavior. Traditional studies of the characteristics of DUI offenders have chiefly focused on the drinking habits and personality traits of these drivers. Moreover, treatments aimed at reducing the rates of DUI have been primarily aimed at reducing consumption. Unfortunately, these efforts have only been minimally effective. Thus, it is important to identify additional mechanisms that might contribute to drunk driving and its recidivism in order to develop more effective treatment programs. The present study aimed to examine the specific behavioral and cognitive mechanisms that might underlie the impulsivity and drinking problems related to DUI by assessing attentional bias and inhibitory control in DUI offenders. We hypothesized that recidivist DUI offenders would exhibit poorer inhibitory control and increased attentional bias compared with both first-time DUI offenders and non-offenders. The findings will highlight Poor impulse control and heightened attraction to alcohol-related imagery in repeat DUI offenders.
specific processes that contribute to the recidivism of drinking and driving offenses, and as such, can inform new programs aimed at reducing the rates of DUI offenses.

**Methods**

**Subjects**
Subjects were 53 adults between the ages of 21 and 40 years. Sixteen subjects were first-time DUI offense (11 men and 5 women), 11 subjects were repeat DUIs (9 men and 2 women), and 26 were control subjects with no DUIs (11 men and 15 women). First time DUI offenders had to receive a DUI offense in the past two years. Recidivist DUI offenders had to receive two or more DUIs within a five year period, with the most recent offense occurring within the past two years. Finally, control subjects had no history of any arrests/convictions for DUI. All DUI convictions were verified by state district court records. All subjects held a valid driver’s license for at least 5 years and drove on a regular (i.e., weekly) basis. Subjects were recruited by newspaper, websites, and community bulletins that invited individuals to participate in studies of cognition, drinking habits and driving history. Some advertisements specifically targeted adults with previous DUI offenses. All subjects were current consumers of alcohol and their typical weekly consumption (i.e., quantity and frequency) was assessed. The University of Kentucky Medical Institutional Review Board approved the study, and subjects received $60 for their participation.

**Apparatus and Materials**

**Visual Probe Task** Attentional bias was measured by a visual probe task. During the task, two pictures (a neutral and an alcohol-related image) were presented side-by-side on the computer screen while subjects completed a reaction time task. Ten alcohol-related images were matched with ten neutral (i.e., non-alcohol-related) images. In addition, there were filler presentations consisting of two neutral images. All image pairs were randomly intermixed. Throughout the task, an eye tracker was used to measure subjects’ visual fixations toward the image pairs. Attentional bias was determined by the degree to which fixation time was greater on the alcohol images compared with the neutral images.

**Cued Go/No-Go Task** Inhibitory control was measured by the cued go/no-go task. This reaction time task requires subjects to respond quickly to go targets and inhibit responses to no-go targets. Response inhibition is measured by the proportion of no-go targets in which subjects fail to inhibit a response (p-inhibition failures). Participants were told that they would be paid for fast responses (i.e., earning $0.05 for responses less than 255 ms), but would lose money for each incorrect response (i.e., losing $0.05 for responding to no-go targets).

**Short Michigan Alcoholism Test (SMAST)** (Selzer, Vinokur, & van Rooijen, 1975). The SMAST provides an assessment of alcoholism and alcohol-related problems. Items concern whether the participant’s drinking has caused problems with family/friends, the legal system, or with health/safety.

**Barratt Impulsiveness Scale (BIS-11)** The BIS-11 assesses the personality dimension of impulsivity. Higher total scores indicate higher levels of self-reported impulsiveness. Scores range from 30 to 120.
Temptation and Restraint Inventory (TRI) (Collins & Lapp, 1992) The TRI was used to provide a measure of drinker’s general trait-like preoccupation with the temptation to drink, and with attempts to restrain oneself from drinking. Items are rated on a Likert scale that ranges from 1 (never) to 9 (always). The measure of interest for this study was the degree to which participants are cognitively and emotionally preoccupied with drinking, the (CEP) scale, which represents the degree to which individuals display a cognitive bias toward alcohol.

Procedure
Subjects attended a single testing session. During the session, they completed questionnaires regarding their drinking habits, drinking-related problems, and personality. They also completed the visual probe and cued go/no-go tasks. Participants were each tested individually, and were paid $60 for their time.

Results
There were no significant group differences in ages between the three groups (p >0.05). The mean ages were 28.5 (SD = 6.4) years for controls, 26.4 (SD = 5.6) years for first-time offenders, and 28.9 (SD = 5.9) years for repeat offenders.

Table 1 presents the mean scores for drinking habits and drinking-related problems for the three groups. One-way analyses of variance (ANOVA) tested group differences among the drinking habit measures and SMAST scores. There was no effect of group for either the frequency or quantity of the sample’s reported drinking. There was, however, a significant effect of group on SMAST scores, F (2, 50) = p < 0.001. A priori pair-wise comparisons revealed that both the first-time and repeat DUI offenders reported significantly greater alcohol-related problems than controls on the SMAST (ps < 0.05). SMAST scores for the repeat offenders were also higher compared with the first-time offenders (p < 0.05).

<table>
<thead>
<tr>
<th>Measure</th>
<th>Control (a)</th>
<th>First-time (b)</th>
<th>Repeat (c)</th>
<th>Pair-wise comparisons</th>
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<tbody>
<tr>
<td>Frequency</td>
<td>2.2 (1.9)</td>
<td>2.8 (1.9)</td>
<td>2.2 (1.6)</td>
<td>a vs. b a vs. c b vs. c</td>
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<td>4.8 (1.9)</td>
<td>5.4 (3.3)</td>
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<tr>
<td>SMAST</td>
<td>1.5 (2.7)</td>
<td>6.5 (5.2)</td>
<td>17.2 (8.5)</td>
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</tr>
</tbody>
</table>

Table 1. Frequency = number of drinking occasions per week; Quantity = number of standard drinks per drinking occasion; SMAST = total score from the SMAST
Asterisks (*) indicate a significant difference between the two groups, p < 0.05

Table 2 presents the mean scores for the questionnaires regarding cognitive preoccupation with drinking (TRICEP), impulsivity (BIS), and the mean performance scores on the visual probe and cued go/no-go tasks. One-way ANOVAs revealed significant effects of group for TRICEP scores, BIS scores, attentional bias, and inhibitory control, ps < 0.05. Pair-wise comparisons showed that there were no significant differences on any of the measures between the control group and the first-time offenders. By contrast, the repeat offenders reported higher impulsivity, more preoccupation with alcohol, greater attentional bias, and poorer inhibitory control than both the controls and the first-time offenders (ps < 0.05).
Poor impulse control and heightened attraction to alcohol-related imagery in repeat DUI offenders

Discussion and Conclusion

This study aimed to identify potential cognitive and behavioral mechanisms that might play a role in drinking and driving by comparing repeat DUI offenders with first-time and non-offenders on measures that assess inhibitory control and attentional bias. With regard to drinking habits, DUI offenders, including both first-time and repeat offenders, did not report significantly greater alcohol consumption compared with control drivers. However, both of the DUI groups reported greater alcohol-related problems on the SMAST, compared with controls. What is more, repeat DUI offenders appear to experience even more problems from drinking compared with first-time offenders even though they do not report drinking more frequently or in greater amounts. The SMAST contains items that refer to legal problems that stem from drinking, including arrests and convictions of DUI. Thus, the higher scores in the DUI groups and in the recidivist group in particular, likely reflect the problems associated with DUI offenses.

The study also showed that repeat DUI offenders report higher levels of cognitive and emotional preoccupation with alcohol as well as greater attentional bias toward alcohol-related stimuli compared with first-time offenders and controls. These results indicate that repeat offenders are more drawn to stimuli associated with alcohol compared with the other groups. Additionally, consistent with previous work, repeat offenders report higher levels of trait impulsivity compared with the other drivers. Moreover, repeat offenders demonstrated poorer inhibitory control based on their greater proportion of inhibitory failures on the go/no-go task compared with the first-time offenders and controls. What is more, the first-time offenders did not differ at all from the controls on any of these measures.

This work is the first to study the inhibitory control and attentional bias in repeat DUI offenders compared with first-time offenders. The findings highlight striking differences in the inhibitory and appetitive processes between these groups of offenders, whereby repeat offenders displayed a marked difficulty inhibiting their behavior and attended more to alcohol-related stimuli compared with first-time offenders and non-offenders. There were no differences among the groups with regard to the frequency and quantity of alcohol consumption. Therefore, the results suggest that poor behavioral regulation coupled with heightened approach tendencies might underlie the propensity to drink and drive in repeat offenders as opposed to problematic drinking that reflects dependence. As such, treatment approaches might be aimed at improving inhibitory mechanisms and reducing attentional bias in offenders in an effort to reduce the likelihood that these individuals will continue to drink and drive.
References


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