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Blind Drunk: The Effects of Alcohol on Inattentional Blindness

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SUMMARY

Alcohol consumption is a major contributor to road accidents. While it is likely that perceptual processing deficits contribute to poorer driving performance among intoxicated individuals, we know little about alcohol's role in particular perceptual processes. For instance, we know that even sober individuals can fail to detect unexpected salient objects that appear in their visual fields, a phenomenon known as *inattentional blindness* (IB; Mack & Rock, 1998). We were interested in whether these visual errors become more or less likely when subjects are under the influence of alcohol or just think that they are drunk. We told half our subjects that they had received alcohol, and half that they had received a placebo. This information was either true or false. Intoxicated subjects (regardless of what they were told) were more likely to show 'blindness' to an unexpected object in their visual field. This finding has practical implications for human performance issues such as driving and eyewitness memory, and theoretical implications for visual cognition.

In an age where multitasking seems to be a desired attribute for many jobs, one of the most critical situations in which good multitasking must be employed is behind the steering wheel. Drivers must focus on road conditions, other vehicles and pedestrians, signs and traffic lights, not to mention cell phone conversations and tunes playing on the car stereo. To what extent does a driver focus on one of these things at the expense of the others? And how might a driver's focus be impacted by alcohol consumption?

There are a number of conditions under which attention to important details of an event or task may be impaired when focus is drawn to other factors. One clear demonstration of this type of attentional deficit is seen in the eyewitness literature. A series of studies initiated by Elizabeth Loftus has revealed a phenomenon known as *weapon focus* (see Loftus, 1979, 1996; Loftus, Loftus, & Messo, 1987). That is, witnesses to a crime involving a weapon are often unable to recall details about the assailant(s) or other details of the crime scene because their attention is diverted to the weapon.

Researchers outside the eyewitness memory arena have also shown that a strong focus on one aspect of an event can mean that critical factors are completely missed (see

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e.g., O'Regan, Rensink, & Clark, 1999; Simons & Levin, 1998). In a classic study demonstrating just how blind we can be when our attention is focused elsewhere, Simons and Chabris (1999) instructed subjects to watch a video clip of two teams passing basketballs back and forth, and to monitor the number of passes occurring within a certain team. During the game, a woman dressed in a gorilla suit walked into the middle of the screen, stopped and beat her chest, then walked away. Interestingly, when later questioned about the incident, roughly half of the individuals did not report noticing the gorilla. Hence, we know that it is common for sober individuals to fail to detect unexpected objects—even very salient ones—that appear in their visual fields, a phenomenon known as *inattentional blindness* (IB; Mack & Rock, 1998). We do not know, however, what happens to these cognitive processes when people are under the influence of alcohol, or simply believe that they have consumed alcohol.

Physiologically, alcohol consumption impairs cognitive functions such as fine motor skills, reaction time, and visual attention (Gustafson, 1986; Mackay, Tiplady, & Scholey, 2002; Rohrbaugh et al., 1988). Studies have also shown that the belief that one has consumed alcohol does not typically affect these same behaviours, though it can affect other, social behaviours (see Assefi (Clifasefi) & Garry, 2003; Hull & Bond, 1986 for a review).

A common procedure used to distinguish the physiological from the placebo effects of alcohol on a dependent variable of interest is known as the balanced placebo design (BPD; Marlatt & Rohsenow, 1980). In the BPD, subjects are either told that they have received a particular substance (such as alcohol) or that they have received a placebo, and what they are told is either true or false. To date, no researchers have examined the effects of alcohol on IB. In the study we present here, we investigate whether subjects who are mildly intoxicated, or simply believe that they have been given alcohol, will be more or less likely to notice a gorilla that appears in their visual field while performing a counting task, compared to subjects who are either sober, or believe that they have been given a placebo.

In the alcohol literature, attentional deficits have been addressed by the psychological model of *alcohol myopia* (see Steele & Josephs, 1990). According to this model, the more intoxicated an individual becomes, the less she is able to allocate sufficient attention to cognitive tasks. Consequently, she attends only to the most salient of environmental cues, and is unable to focus on surrounding factors. For example, an individual experiencing alcohol myopia while driving may pay a great deal of attention to her speedometer to ensure she is staying within the speed limit, at the expense of other significant details such as a pedestrian crossing the street, or another car directly in front of her. This alcohol-induced cognitive impairment model helps explain the attention-related mistakes that people make while intoxicated.

Based on alcohol myopia theory, we predict that subjects who actually receive alcohol, regardless of what they are told, will find it difficult to direct their attention to information outside of that required for the counting task. As a result, mildly intoxicated individuals may experience an additional layer of blindness above and beyond which we might expect with sober individuals. These individuals would thus be more likely to miss the gorilla than people who have not been drinking.

Moreover, if attention is the mechanism driving IB,[1] we should not see any alcohol placebo effects, since alcohol placebos do not affect purely cognitive tasks. Hence, subjects who receive a placebo should notice the gorilla equally often, regardless of what they are

[1]See Wolfe (1999) for a discussion of other potential underlying mechanisms responsible for IB.

told about their beverage. An alternative prediction is that subjects who receive alcohol may experience such extreme cognitive deficits that they cannot focus on the counting task and therefore may be *more* likely to notice the gorilla than their sober counterparts.

Isolating and determining the contributions of both the physiological and placebo effects of alcohol on visual processes provides scientists with insight into how intoxication affects representations of our visual world and may also provide useful insight into areas of human performance.

METHOD

Subjects

Forty-seven adults between the ages of 21 and 35 years participated in the experiment. Subjects were paid $10.00 per hour for their time.

Design

Our study used the full 2×2 BPD. Subjects were randomly assigned to one of the four conditions of the BPD: Told Alcohol/Got Alcohol, Told Alcohol/Got Placebo, Told Placebo/Got Alcohol or Told Placebo/Got Placebo.

PROCEDURE

Potential subjects responded to advertisements placed in local newspapers. We telephone-screened individuals for problem drinking behaviours (i.e. heavy drinking) and medical contra-indications to drinking (i.e. heart or liver disease, psychiatric disorders, pregnancy). Subjects who reported these conditions were not eligible for participation.

Subjects participated in same-sex groups of four or less. Upon arrival at the session, the experimenter met with subjects individually in a private room to gather valid proof of age identification, weigh subjects, and verify medical and drinking habits information. Additionally, we screened female subjects for pregnancy and breathalysed all subjects using the AlcoHawk^{TM} CA2000/ABI to ensure their blood alcohol level (BAL) was 0.0.

After the individual screening, subjects assembled in the Behavioural Alcohol Research Lab (BARLAB) at the University of Washington: a room in the Psychology Department designed to simulate a cocktail lounge. A volunteer selected an envelope that seemingly revealed the group's drinking condition and the experimenter announced the results to the group. However, the bartender secretly chose another envelope containing the group's actual drinking condition, which either matched, or did not match, what subjects were told.

All drinks were prepared in full view of subjects. We used successful procedures from past BPD studies to convince subjects that they were indeed receiving the said beverage (see Assefi (Clifasefi) & Garry, 2003). Subjects consumed a total volume of liquid determined by their weight and sex. Subjects in the alcohol condition received vodka and tonic beverages achieving BAL 0.04—half the legal driving limit of most states in the United States. The alcohol dose for each subject was developed in accordance with the Washington State Liquor Board. Subjects in the placebo condition received plain tonic beverages.

We gave subjects 10 minutes to consume their beverages and asked them to space their drinking across this length of time. At the end of the drinking period we allowed an additional 5 minutes to pass before individually bringing subjects into a back room and administering a breath test. Once the subjects' BAL had been recorded, we showed the subject an edited version (25 seconds instead of the original 75 seconds) of Simons and Chabris (1999) gorilla clip and instructed the individual to count the number of times the white t-shirt team passed the ball. Afterwards, we briefly interviewed each subject to determine whether or not the subject had observed the gorilla.

Finally, we asked subjects to rate the extent (on a five point scale) to which they had experienced certain cognitive and physiological effects during the study (e.g. 'I had difficulty thinking', 'My head felt fuzzy'). We also asked them to rate how intoxicated they felt on a scale from 0 (not intoxicated at all) to 4 (extremely intoxicated). Subjects were monitored until their BAL fell below 0.03. At this point, they were fully debriefed, paid, and released.

RESULTS AND DISCUSSIONS

Data from one subject were discarded due to this subject previously having seen the gorilla clip, yielding results from 46 subjects.

First, subjects believed what we told them about their beverage. Told Alcohol subjects rated their physiological and cognitive effects as more impaired than Told Placebo subjects as shown by the 2 (instruction condition) $\times$ 6 (physiological effects ratings) MANOVA, F $(1, 44) = 4.98$, $p = 0.03$ (see Figure 1); and the 2 (instruction condition) $\times$ 5 (cognitive effects ratings) MANOVA, F $(1, 44) = 8.64$, $p < 0.01$, (see Figure 2). Moreover, Told Alcohol subjects also reported higher levels of intoxication ($M = 1.23$, SE $= 0.15$) compared to Told Placebo subjects ($M = 0.30$, SE $= 0.16$), F $(1, 44) = 18.12$, $p < 0.01$. There was no interaction between drink $\times$ instruction on any of the outcome measures. Taken together, these results indicate that our drink instruction was effective in creating a 'feeling' of intoxication, ruling out the possibility that subjects did not buy the manipulation.

Overall, regardless of condition, only 33% of subjects noticed the gorilla. Table 1 shows a breakdown of subjects who noticed the gorilla for each of the four conditions. There were no interactions between drink $\times$ instruction on this measure, thus we present the drink manipulation and the instructional manipulation data separately.

Drink manipulation (got alcohol vs. got tonic)

Did alcohol, regardless of instruction, affect one's ability to notice the gorilla? The simple answer is yes. That is, when subjects were mildly intoxicated, only 18% noticed the gorilla compared to 46% of sober subjects ($\chi^2 = 4.00$, $p < 0.05$). The effect was moderate,[2] $V = 0.30$. Thus, alcohol appears to be adding an additional layer of blindness.

[2]The effect sizes for the Cramer's V coefficients were interpreted using Rea & Parker (1992) conventions for describing the magnitude of association in contingency tables: 0.00 to under 0.10—negligible association, 0.10 to under 0.20—weak association, 0.20 to under 0.40—moderate association, 0.40 to under 0.60—relatively strong association, 0.60 to under 0.80—strong association and 0.80 to 1.00—very strong association.

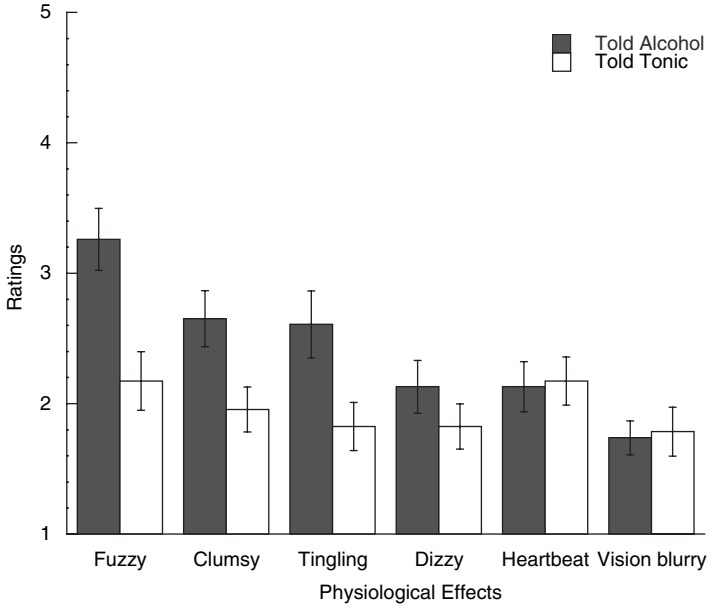

Figure 1. Participants' mean ratings of the physiological effects that they experienced as a function of instruction (Told Tonic vs. Told Alcohol). Error bars represent standard error for each mean

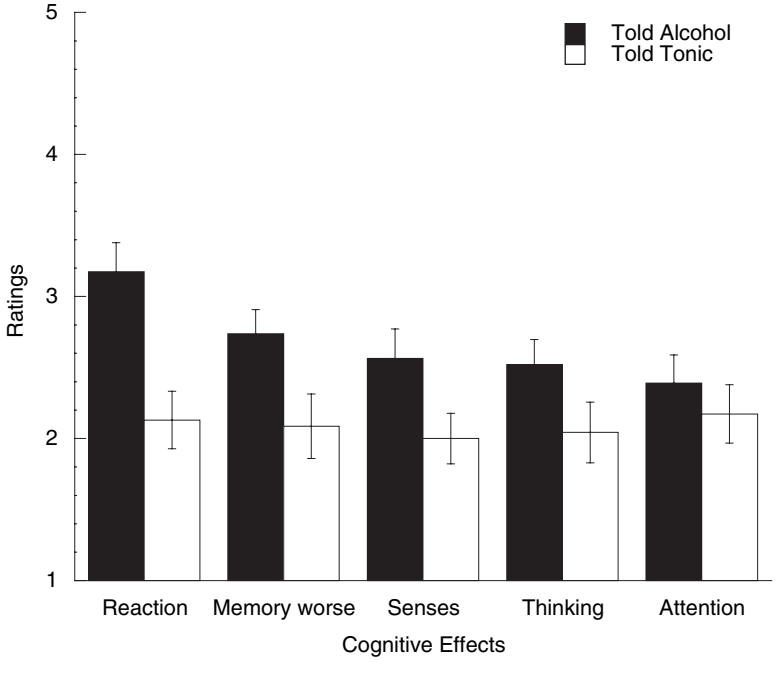

Figure 2. Participants mean ratings of the cognitive effects that they experienced as a function of instruction (Told Tonic vs. Told Alcohol). Error bars represent standard error for each mean

Table 1. Percentage of subjects who noticed the gorilla by condition

	Got alcohol (%)	Got tonic (%)
Told alcohol	18	42
Told tonic	18	50

Instructional manipulation (told alcohol vs. told tonic)

Was our instruction sufficient, regardless of what subjects actually got, to produce IB? Our results show that instruction did not dictate whether subjects noticed the gorilla. That is, 30% of all Told Alcohol subjects saw the gorilla versus 33% of all Told Placebo subjects ($\chi^2 = 0.10$, $p = 0.75$, $V = 0.04$). Put simply, whether subjects noticed the gorilla was not dependent on what we told them about the content of their beverage.

Overall, our results showed that mildly intoxicated people were more likely to miss the gorilla than people who had not touched a drop of alcohol. By contrast, alcohol placebos did not appear to affect IB. These results are consistent with an attentional explanation. The visual cognition literature shows that when people allocate their attention to specific cues within a scene, they become 'blind' to other pertinent information in the scene. The alcohol literature shows that as people become more intoxicated, they only attend to salient cues, at the expense of other perceptual information. In our study, alcohol caused a narrowing of attention to one specific aspect of a scene (counting passes), such that other information in the scene (the gorilla) was more likely to be ignored.

SUMMARY

The fact that even a mild dose of alcohol affects how we process visual information has both practical and theoretical implications. On the practical side, even at only *half* the legal driving limit in the US, our subjects were at a significantly increased risk of failing to notice an unexpected object compared to their sober counterparts. In light of this result, perhaps lawmakers should reconsider the level of intoxication deemed legal to operate a vehicle. Moreover, our findings have implications for situations in which witnesses to a crime are intoxicated. For example, if mildly intoxicated individuals are able to direct their attention to a specific aspect of a scene while disregarding other surrounding information, they may be very accurate about that aspect of the crime scene. Yuille & Tollestrup (1990) work on alcohol and eyewitness memory revealed that while intoxicated individuals exhibited poorer recall and less accuracy for crime scene details relative to their sober counterparts, they showed no difference when it came to identifying a perpetrator. Thus, in some instances alcohol may not negatively influence all aspects of eyewitness memory.

Recall that one attentional deficit in the eyewitness memory arena is weapon focus. Recently, researchers exploring explanations for weapon focus have proposed that people focus on a weapon precisely because it is unusual and unexpected (e.g. Pickel, 1998, 1999). However, our findings show that drunken individuals are not as likely as sober individuals to notice an unexpected and unusual object in their visual field when attending to another aspect of the scene. Therefore, under certain circumstances intoxicated individuals may be less likely to show weapon focus, or merely take longer to notice the weapon than sober

individuals. Since we know that both sober and intoxicated individuals experience IB to varying degrees and that sober people experience weapon focus to varying degrees, it may be worth exploring the relationship between these two phenomena. Given the high co-occurrence of criminal activity and alcohol consumption (Yuille & Tollestrup, 1990), future research that incorporates the influence of alcohol into various eyewitness memory paradigms would be beneficial.

Our results also have important theoretical implications. In our experiment, mildly intoxicated subjects were unable to focus outside the directed goal (counting), a finding consistent with alcohol myopia. Because attention is the cognitive lynchpin of perception (Simons & Chabris, 1999), these subjects experienced a form of alcohol-induced IB, over and above the level we expected from sober subjects. Moreover, that there were no placebo effects of alcohol on IB further supports an attentional explanation for the phenomenon.

Our results were inconsistent with the alternative hypothesis we presented. Recall that we suggested extremely strong attentional deficits might reverse the pattern of results predicted by alcohol myopia: subjects might be incapable of focusing on the counting task, thus actually more likely to notice the gorilla. Though our findings did not support this idea, it is possible that greater states of intoxication might provide a different result. Nonetheless, our mildly intoxicated subjects demonstrated a substantial perceptual deficit, indicating that even having one stiff drink can make you blind drunk.

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