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Problematic Alcohol Use and Acute Intoxication Predict Anger-Related Attentional Biases: A Test of the Alcohol Myopia Theory

Andrea A. Massa,

Purdue University

Olivia S. Subramani,

Georgia State University

Christopher I. Eckhardt, and

Purdue University

Dominic J. Parrott

Georgia State University

Abstract

Previous research has demonstrated a significant association between alcohol and aggression. However, the precise mechanisms underlying this relationship have yet to be fully elucidated. In the present study, we examined alcohol's effects on an attentional bias toward aggressogenic cues as the first step in a possible mediation model of alcohol-facilitated intimate partner aggression. More specifically, we tested an interactive effect of problematic alcohol use and acute alcohol intoxication on an attentional bias toward anger words. Participants in this study were 249 male and female heavy drinkers from the community with a history of past-year intimate partner aggression perpetration who participated in an alcohol-administration laboratory study assessing the effect of alcohol intoxication on cognitive biases. Multiple linear regression was used to test the proposed moderation model. Acute alcohol intoxication moderated the effect of problematic alcohol use on an attentional bias toward anger, with this effect being stronger for individuals in the alcohol compared to no-alcohol control condition. These findings suggest that problematic drinkers may be more likely to attend to aggressogenic stimuli while acutely intoxicated, relative to when they are sober.

Keywords

alcohol; aggression; anger; cognitive bias; attention

Past research has established that alcohol is a contributing cause of aggression (Leonard, 2005), with an estimated 50–86% of aggressive and violent episodes involving alcohol consumption (National Institute on Alcohol Abuse and Alcoholism, 2005; Pernanen, 1991; WHO Global Status Report on Alcohol and Health, 2014). Despite the overwhelming

Author Note: Andrea A. Massa, Department of Psychological Sciences, Purdue University; Olivia S. Subramani, Psychology Department, Georgia State University; Christopher I. Eckhardt, Department of Psychological Sciences, Purdue University; Dominic J. Parrott, Psychology Department, Georgia State University. Corresponding author, Andrea A. Massa, Department of Psychological Sciences, Purdue University, 703 Third Street, West Lafayette, Indiana 47907-2081.

evidence for a causal link between alcohol and aggression, evidence of mechanisms accountable for this relation is lacking. The present study sought to investigate cognitive biases as one potential avenue by which alcohol may lead to intimate partner aggression (IPA).

The associations among cognitive biases, alcohol, and aggression have been examined in several ways over the past few decades. Research has examined the link between cognitive biases and both retrospective self-reported intimate partner and general aggression perpetration as well as aggressive behavior observed in the laboratory (e.g., Eckhardt, Barbour, & Davison, 1998; Smith & Waterman, 2003). Results of these studies suggest that provocation can lead to aggression-related cognitive biases (Bertsch, Bohnke, Kruk, & Naumann, 2009) and that dispositionally aggressive individuals attend more to aggressogenic stimuli and harbor a greater amount of cognitive biases compared to nonaggressive individuals (Eckhardt et al., 1998; Taft et al., 2015). Associations between cognitive biases and problematic alcohol use as well as acute intoxication have been studied in regard to biases toward alcohol and anxiety-related stimuli (e.g., Euser & Franken, 2012; Lusher, Chandler, & Ball, 2004). People with patterns of problematic alcohol use exhibit impairment in the accurate and efficient discrimination of emotion words (Endres & Fein, 2013; Lusher et al., 2004), and acute intoxication has been linked to greater response bias for angry and happy faces (Euser & Franken, 2012). However, research has not directly examined the impact of alcohol on cognitive biases toward aggression-related cues. The purpose of the current study was to extend the literature by examining the interactive effect of problematic drinking and acute intoxication on a bias toward aggressogenic cues (i.e., anger words) in the context of intimate relationship conflict.

Alcohol myopia theory (AMT) provides a general framework through which alcohol's effects on cognition can be better understood (Steele & Josephs, 1990). AMT posits that the pharmacological effect of alcohol taxes the inebriate's cognitive resources and that the resulting impairment in cognitive processing limits the individual's ability to attend to environmental stimuli. According to the attention-allocation model of AMT, alcohol intoxication serves to narrow one's limited attention onto the most salient cues in the environment, with less salient cues being largely ignored (Steele & Josephs, 1990). This model predicts that aggressive behavior will be more likely to occur when aggressogenic cues are most salient to the intoxicated individual and less likely to occur when aggression-inhibiting cues are most salient (Giancola et al., 2010). Tests of AMT in the context of alcohol and aggression have found that when the attention-narrowing effect of alcohol onto aggressogenic stimuli is disrupted, alcohol's effect on aggression appears to be ameliorated (Gallagher & Parrott, 2011; Gallagher & Parrott, 2016; Giancola & Corman, 2007). Furthermore, in the one study of which we are aware that has examined alcohol's effects on cognitive biases toward aggressogenic cues, individuals who were both intoxicated and distracted exhibited a reduced attentional bias toward aggression words compared to those who were sober or not distracted (Gallagher & Parrott, 2011). Thus, alcohol's effects on aggressive behavior and cognitive biases toward aggressive cues appear to be reduced when the attention-narrowing effect of alcohol is disrupted. However, the cumulative effect of both patterns of problematic alcohol use and alcohol intoxication on attention toward aggressogenic cues has yet to be examined.

The Current Study

Past research supports an association between cognitive biases and both aggressive behavior and alcohol use. The purpose of the current study was to fill this gap in the literature by directly testing the first step of a potential mediation pathway between alcohol and IPA. We sought to examine the interactive effect of alcohol intoxication and patterns of problematic alcohol use on attentional bias toward anger in a sample of community adults who reported past-year intimate partner aggression (IPA) perpetration. Specifically, we tested the hypothesis that beverage condition (i.e., alcohol vs. no-alcohol control) would moderate the relation between problematic alcohol use and anger bias, such that this association would be stronger for individuals in the alcohol condition compared to those in the no-alcohol control condition.

Method

Participants and Recruitment

Intimate couples who had been dating for at least one month were recruited from two U.S. metropolitan cities through print and online advertisements. Interested couples were screened via telephone to determine their initial eligibility. Initially eligible couples then presented to the laboratory for a two-part study. During the first session, couples' eligibility for session 2 was reassessed. Couples who remained eligible after session one were scheduled to complete the second session on a different day and were told that they would receive either an alcoholic or non-alcoholic beverage during the second session.

Couples were excluded if either partner reported serious head injuries, a medical or psychiatric condition in which alcohol is medically contraindicated, or a desire to seek treatment for alcohol use. At least one partner – termed the *index participant* – was required to meet two additional eligibility criteria: (1) report consumption of an average of at least five (for men) or four (for women) alcoholic beverages in a single episode at least twice per month during the past year; (2) report perpetration of at least one act of past-year psychological or minor physical IPA against their current partner via self- or partner- report on the Revised Conflict Tactics Scale (CTS2; Straus, Hamby, Boney-McCoy, & Sugarman, 1996). For the 122 couples in which both partners met all eligibility criteria, one partner was randomly selected to be the index participant.

Telephone screening identified 613 eligible couples who presented to the laboratory. Reassessment of eligibility criteria during Session 1 led to the exclusion of 324 couples. Couples were excluded for failing to meet inclusion criteria described above ($n = 86$ couples) or for reporting a non-heterosexual identity ($n = 42$ couples) or perpetrating severe physical IPA ($n = 196$ couples), as assessed by the CTS2. This led to 289 couples who presented to Session 2. Of the 289 index participants, 29 were excluded for not reaching the required Breath Alcohol Concentration (BrAC; $n = 7$), not being deceived ($n = 12$), and unpredictable miscellaneous events ($n = 10$) such as not understanding instructions or not finishing their beverage. Eleven participants chose to withdraw from Session 2, leaving a final sample of 249 participants (148 men, 101 women). The study was approved by each university's Institutional Review Board.

Measures

Alcohol Use Disorder Identification Test—(AUDIT; Babor et al., 2001). This validated 10-item scale measures hazardous and harmful patterns of alcohol consumption. Participants rate items on a 0 to 4 scale. The total sum score was used in this study, with higher scores indicating greater problematic drinking ($\alpha = .77$).

Revised Conflict Tactics Scale—(CTS2; Straus et al., 1996). This 78-item self-report instrument measures a range of events that occur during disagreements within intimate relationships. Participants rate on a 0 (never) to 6 (more than 20 times) scale how many times they have engaged in these behaviors over the past year.

Provocation

To test study hypotheses, it was necessary to expose participants to conditions that would maximize the likelihood of eliciting anger in an ostensible interaction with their partner. As such, a modified version (Giancola & Zeichner, 1995) of the Taylor Aggression Paradigm (TAP; Taylor, 1967) was used. The hardware for the task was developed by Coulbourn Instruments (Allentown, PA) and the computer software was developed by Vibranz Creative Group (Lexington, KY). In this task (Giancola & Parrott, 2008), participants were told they would engage in a reaction time competition in which electrical shocks are administered to and received from their intimate partner. Trials were actually rigged so that participants lost a disproportionate amount of trials and received physical (i.e., moderate intensity shocks) and verbal (i.e., written negative feedback) provocations from their “partners.” Although the TAP is primarily intended to measure physical aggression, the task is designed to create an adversarial interaction wherein participants experience heightened anger (Parrott, Zeichner, & Stephens, 2003).

Dot Probe Task

The dot probe task (Mogg & Bradley, 1999a, 1999b) was used to assess attention allocation to anger-themed, relative to neutral-themed, words. The task was created with DirectRT software (Jarvis, 2014) and presented on a desktop computer. Previous work with this task and its modifications (reviewed in Mogg & Bradley, 1999a, 1999b) has established its reliability and validity as a measure of attention bias in clinical versus nonclinical samples (e.g., Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van IJzendoorn, 2007; MacLeod et al., 1986) as well as in experimentally primed versus control samples (reviewed in Matthews & MacLeod, 2002). The Dot Probe task has previously been used in conjunction with the TAP to measure cognitive biases (Gallagher & Parrott, 2011).

There were 26 anger-neutral word pairings¹ matched on word frequency, first letter, and syllabic length, and 40 neutral-neutral word pairings to mask the theme of the study. Attention allocation to anger-themed, relative to neutral-themed, words was termed *anger bias* and was calculated by subtracting the mean reaction time (RT) to probes that replace anger words from the mean RT to probes that replace neutral words. More positive scores indicate faster responses (i.e., an attentional bias) to probes replacing anger words. Anger

¹Word pairings used in the current study are available from the author by request.

bias scores were calculated using RTs from bottom-probe trials only². Given that tasks measuring reaction time are especially susceptible to random error (e.g., distraction, delayed responding) and per widely accepted standards in the literature for identifying and handling outliers, trials with RTs 2 SD from an individual's session mean were removed from data analysis.

Procedure

Participants completed a questionnaire battery containing the AUDIT (Session 1). Prior to Session 2, the experimenter randomly assigned the index participant to the alcohol ($n=122$) or no-alcohol control ($n=127$) condition. Upon arrival to the laboratory for Session 2, participants were informed of their beverage condition and given a fictitious cover story in order to disguise the true aims of the provoking task. Next, the partner was escorted to a separate testing room to ostensibly consume his or her beverage. In actuality, the partner received a full debriefing of the study, was compensated, and discharged. Index participants were administered an alcoholic or non-alcoholic beverage over a 20-minute period. The alcohol beverage consisted of .99g/kg of 95% alcohol mixed at a 1:5 ratio with Tropicana orange juice, a dose which reliably produces BrAC levels between .08% and .12% (Duke et al., 2011). The isovolemic non-alcoholic beverage consisted of only orange juice. While consuming the beverage, index participants completed 10 practice trials of the dot-probe task. Participants were seated approximately 3 feet in front of a computer screen and were instructed to “hover” the index finger of their dominant hand over the down arrow key in a “ready” position throughout the task. Following a 500 ms display of a fixation “x”, two words appeared on the screen, one above the other, and remained for 500 ms. Next, a probe (either a left-facing arrow or a right-facing arrow) replaced one of the words. Participants were asked to press – as quickly and accurately as possible – the left or right arrow key if the word was replaced by a left-facing arrow or right-facing arrow, respectively.

Next, participants completed a pain threshold assessment to determine the intensity parameters for the shocks they would receive during the competitive task. This was accomplished via the administration of one-second duration shocks presented in an incremental stepwise intensity method from the lowest available shock setting, which is imperceptible, until the shocks reached a reportedly “painful” level. All shocks were administered through two electrodes that were attached to the index and middle fingers of the nondominant hand. The experimenter was in the adjacent control room and communicated with the participant through an intercom. Upon reaching a BrAC of .075, participants completed six “practice” TAP trials designed to create an adversarial interpersonal interaction. Specifically, participants received moderate physical provocation from their “partner” followed by verbal provocation via a questionnaire with their “partner's” feedback about their performance. Immediately thereafter, participants completed the dot probe task and BrAC was reassessed. Participants were interviewed to indirectly assess the credibility of the experimental manipulation, debriefed, and

²Research suggests that scores obtained from trials in which probes replace words on the bottom are more reliable and accurate measures of attention allocation (Price et al., 2015). This is likely due to the tendency for eye gaze to be naturally drawn to the top half of the computer screen.

compensated \$10/hour. All individuals who received alcohol remained in the laboratory until their BrAC fell to .03% and were escorted to prearranged transportation by laboratory staff.

Analytic Plan

Hierarchical linear regression was used to examine the moderating effect of alcohol on the association between problematic drinking and anger bias. Problematic drinking was mean centered and beverage group was dummy coded (Alcohol = 0, No-Alcohol Control = 1; Aiken & West, 1991). The interaction term was calculated by obtaining the cross-products of the mean-centered problematic drinking variable and dummy coded beverage variable. In the first step of the model, problematic drinking and beverage condition were entered as predictors. This step provided tests of the main effects of problematic drinking and beverage condition on anger bias. In the second step, the interaction term was entered. This step provided a test of the moderating effect of beverage on the association between problematic drinking and anger bias.

Results

A paired samples t-test indicated that participants' BrACs in the alcohol group were significantly higher post-task ($M = .106\%$, $SD = .016$) than pre-task ($M = .093\%$, $SD = .014$), $t(120) = -9.55$, $p < .001$. The first step of the regression model was not significant. Main effects of problematic drinking ($\beta = .077$, $p = .23$) and beverage condition ($\beta = -.027$, $p = .67$) were not detected. Step 2 of the model was significant, $R^2 = .03$, $F(3, 245) = 3.33$, $p = .02$. Results indicated a significant Problematic Drinking x Beverage interaction, $b = 18.37$, $p = .004$. Explication of this interaction revealed that problematic drinking was positively associated with a bias toward anger words for intoxicated participants ($\beta = .265$, $p = .004$) but not for participants who did not consume alcohol ($\beta = -.098$, $p = .26$; see Figure 1).

Discussion

The present study supports a theory-driven model of an alcohol-facilitated cognitive bias. Results reveal that problematic alcohol use was associated with an attentional bias toward aggressogenic stimuli (i.e., anger words) for individuals in the alcohol, but not the no-alcohol control, condition. This pathway represents the first step in a potential mediational model of alcohol-facilitated IPA. These findings suggest that problematic drinkers are more likely to attend to aggressogenic stimuli while acutely intoxicated, but not while sober. Interestingly, neither acute intoxication nor problematic drinking alone was sufficient to display this bias. This finding supports I³ theory (Finkel, 2014), in that problematic drinking may serve as an impellor that only leads to cognitive biases in the presence of the disinhibiting effect of intoxication.

Implications

The current findings are consistent with past theory and research. AMT suggests that alcohol intoxication narrows the inebriate's attention onto the most salient and provocative cues in the environment (Giancola et al., 2010). In the current study, participants were provoked

before engaging in the dot probe task, and thus for participants with a history of problematic drinking who were intoxicated, anger words were the most salient cues in the environment. Whereas participants in the no-alcohol group may have retained the cognitive resources to direct their attention elsewhere, intoxicated participants were captivated by the aggressogenic cues.

Associations between alcohol, aggression, and cognitive biases have been established in the existing literature (e.g., Eckhardt et al., 1998; Euser & Franken, 2012). However, no single study of which we are aware has examined how alcohol affects cognitive biases toward aggressogenic cues among IPA perpetrators. The current findings are consistent with past research examining attentional biases toward threat among intoxicated individuals (Euser & Franken, 2012; Gerlach et al., 2006). In addition, the present findings extend existing research on alcohol intoxication and attentional deployment (Gallagher & Parrott, 2011; Gallagher & Parrott, 2016) by showing that the acute effects of alcohol may lower the threshold for an attentional bias toward aggressogenic cues among IPA perpetrators with problematic alcohol use.

Limitations

A few limitations of the current study warrant discussion. First, the measure of problematic alcohol use was a retrospective self-report questionnaire, which is subject to selective reporting and memory biases. This may have led to underreporting of alcohol use and related problems. However, we experimentally manipulated beverage condition by administering alcoholic or non-alcoholic beverages to participants and we used a behavioral measure of attention, both of which lend strength to the current study. Given that our sample of heterosexual individuals was characterized by heavy drinking and relationship conflict, the current findings may not generalize beyond this relatively unique population.

The current study provides new data on the interactive effects of problematic alcohol use and acute intoxication on attentional bias toward anger. Findings suggest that for intoxicated IPA perpetrators, problematic alcohol use was significantly associated with an attentional bias. The current study supports the first step in a potential mediation model, whereby an attentional bias toward aggressogenic cues mediates the association between alcohol and IPA. It is hoped that future research will examine this proposed model in full by examining whether this alcohol-facilitated attentional bias predicts aggressive behavior.

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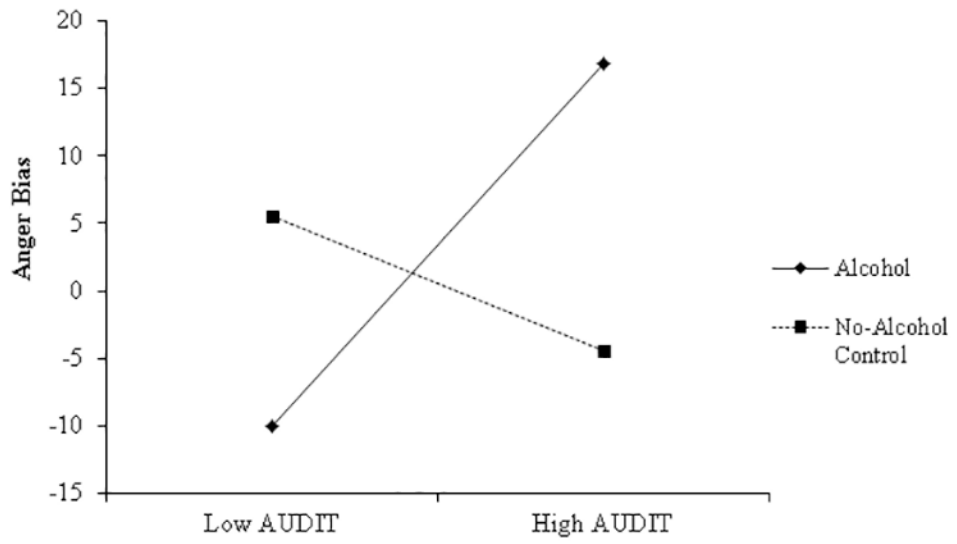


Figure 1. Beverage condition moderates the relation between AUDIT and Anger Bias.

Table 1.

Participant demographics and descriptive statistics

	Alcohol (<i>n</i> = 122)		No-Alcohol (<i>n</i> = 127)		<i>t</i>	<i>p</i>
	Mean	<i>SD</i>	Mean	<i>SD</i>		
Age	31.63	10.71	33.26	10.24	1.23	.22
Years of education	13.72	2.72	13.75	2.87	.092	.93
Length of relationship, in months	52.85	53.05	53.87	59.55	.128	.90
Drinking days per week	2.83	1.82	2.93	1.89	.403	.69
Drinks per drinking day	6.38	3.02	6.34	3.89	-.087	.93
AUDIT	9.45	5.20	10.04	5.30	-0.89	.38

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