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Building toward an Intervention for Alcohol-Related Aggression: A Cognitive and Behavior Test of the Attention Allocation Model

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BUILDING TOWARD AN INTERVENTION FOR ALCOHOL-RELATED
AGGRESSION: A COGNITIVE AND BEHAVIOR TEST OF THE ATTENTION
ALLOCATION MODEL

by

KATHRYN E. GALLAGHER

Under the Direction of Dominic J. Parrott, Ph.D.

ABSTRACT

This study provided the first direct test of the cognitive underpinnings of the attention-allocation model and attempted to replicate and extend past behavioral findings for this model as an explanation for alcohol-related aggression. Men were randomly assigned to a beverage (Alcohol, No-Alcohol Control) and a distraction (Moderate Distraction, No Distraction) condition. All men were provoked by a male confederate and completed a dot probe task and a laboratory aggression task without distraction or while presented with a moderate distraction task. Results indicated that intoxicated men whose attention was distracted displayed significantly lower levels of aggression bias and enacted significantly less physical aggression than intoxicated men whose attention was not distracted. However, aggression bias did not account for the lower levels of alcohol-related aggression in the distraction, relative to the no-

distraction, condition. Discussion focused on how these data inform intervention programming for alcohol-related aggression.

INDEX WORDS: Alcohol consumption, Alcohol myopia theory, Attention-allocation model, Physical aggression

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in the College of Arts and Sciences

Georgia State University

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INTRODUCTION

Evidence for the link between acute alcohol consumption and aggression is well-established. Conservative estimates from a recent nationally representative study indicate that alcohol was involved in 63% of intimate partner violence episodes, 39%-45% of murders, 32%-40% of sexual assaults, and 45%-46% of physical assaults (Greenfeld & Henneberg, 2001). Although the long-term effects of chronic alcohol use have been the primary focus of aggression research in the past (Naranjo & Bremner, 1993), recent research suggests that it is the acute effects of alcohol intoxication that impact aggressive behavior the most (Chermack & Blow, 2002; Murphy, Winters, O'Farrell, Fals-Stewart, & Murphy, 2005). Indeed, laboratory-based studies have consistently established that participant aggression increases when alcohol is administered (for a review, see Bushman & Cooper, 1990; Ito, Miller, & Pollock, 1996; Steele & Southwick, 1985).

Though correlational research has led to significant advancements in the understanding of the link between history of alcohol consumption and aggression, experimental research has elucidated the theoretical mechanisms that underlie this association. Such studies typically involve the use of laboratory-based paradigms designed to directly measure aggressive behavior in intoxicated participants. Though researchers were once reluctant to use experimental methodology to examine alcohol-related aggression, the emergence of these paradigms has allowed researchers to pursue this work in a safe and ethical manner. In fact, this methodology has generated the most direct evidence to support a causal link between alcohol and aggression (Taylor, 1993).

To date, the most popular of these laboratory-based paradigms is the Taylor Aggression Paradigm (TAP; Taylor, 1967) and its various modifications (e.g., Berkowitz & LePage, 1967;

Giancola & Zeichner, 1995a; Zeichner, Parrott, & Frey, 2003; Zeichner & Pihl, 1979).

Extensive support has been obtained for the reliability and validity of these paradigms as direct measures of physical aggression (for a review, see Anderson & Bushman, 1997; Giancola & Chermack, 1998; Giancola & Parrott, 2008). In a traditional TAP study, a participant delivers and receives electric shocks to and from a fictitious opponent under the guise of a competitive reaction time task. The win-loss sequence, as well as the levels of shock participants receive when they lose trials, are predetermined and controlled by a computer program. Participants are free to deliver a range of shocks to their opponent when they win trials. Accordingly, aggression is derived from the intensity and duration of shock a person selects to deliver to his/her fictitious opponent (Taylor 1967; 1993; Giancola & Chermack, 1998; Giancola & Parrott, 2008). Though this methodology has greatly impacted alcohol and aggression research, meta-analytic studies that do not involve laboratory aggression paradigms have also supported a causal link between alcohol intoxication and increased aggression (Bushman & Cooper, 1990; Ito et al., 1996; Steele & Southwick, 1985).

Theoretical Explanations for Intoxicated Aggression

Despite the causal link between acute alcohol consumption and aggressive behavior, the exact mechanisms by which alcohol increases aggression remain unclear. In response, numerous theories for this relation have been advanced. The three most prominent explanations for intoxicated aggression propose that the pharmacological properties of alcohol impact aggressive behavior by decreasing the anxiety/fear response (Pihl, Peterson, & Lau, 1993), increasing arousal (Rule & Nesdale, 1976), and disrupting executive cognitive functioning (Giancola, 2000, 2004; Steele & Josephs, 1990).

Alcohol reduces fear. Extant research suggests equivocal findings between alcohol intoxication and anxiety/fear. Specifically, alcohol has been shown to increase, decrease, or have no impact on the anxiety/fear response (Cappell & Greeley, 1987; Sher, 1987; Steele & Josephs, 1988). This inconsistently has led to mixed findings in the alcohol and aggression literature. For example, alcohol has been shown to facilitate aggression by decreasing an individual's fear and/or anxiety response (Pihl, Peterson, & Lau, 1993). For example, while sober, a provoked individual may experience heightened anxiety and/or fear due to the negative consequences (e.g., retaliation, jail) associated with aggressive behavior. In this instance, the experience of anxiety and fear is posited to suppress an aggressive response because the anxiety/fear response facilitates attention toward potential negative consequences. However, if intoxicated, the same individual is presumably less likely to experience anxiety and fear due to the anxiolytic effects of alcohol. As such, the intoxicated individual is more likely to respond with aggressive behavior (Ito et al., 1996; Phillips & Giancola, 2008). However, other research indicates that alcohol increases anxiety/fear and subsequent aggression (Parrott, Gallagher, & Zeichner, under review). This research posits that heightened anxiety/fear narrows attention onto threat-related stimuli in intoxicated individuals, which consequently increases aggressive behavior.

Alcohol increases arousal. Increased arousal has been associated with aggressive behavior (for a review, see Anderson & Bushman, 2002; Rule & Nesdale, 1976). Moreover, alcohol consumption has been found to differentially impact arousal on the ascending and descending limbs of the Blood Alcohol Content (BAC) curve (Addicott, Marsh-Richard, Mathias, & Dougherty, 2007; Giancola & Zeichner, 1997; Martin, Earleywine, Musty, Perrine, & Swift, 1993). Specifically, research suggests that human arousal increases during the

ascending limb of the BAC curve when the stimulant effects (e.g., vigor) of alcohol intoxication are most prominent. Conversely, human arousal reportedly decreases during the descending limb of the BAC curve when the sedative effects (e.g., fatigue) of alcohol intoxication are most prominent. Accordingly, experimental research has shown that aggression most often occurs during the ascending limb of intoxication (Giancola & Zeichner, 1997).

Alcohol reduces inhibitory control. The pharmacological effects of alcohol have been shown to disrupt executive cognitive functioning that is central to maintaining inhibitory control over behavior (Giancola, 2000, 2004; Steele & Josephs, 1990). Giancola (2000) suggested that these cognitive abilities are part of an overall construct of executive functioning. Specifically, the cognitive abilities central to this disruption include abstract reasoning, conceptualization, planning, problem solving, decision making, information processing, and inhibition (Chermack & Giancola, 1997; Kimberg & Farah, 1993; Steele & Josephs, 1990). Thus, the robust relation between alcohol-induced executive cognitive impairment and aggression is not surprising.

Nevertheless, it is important to note that the literature on cognitively mediated intoxicated aggression is extensive, and myriad other factors have been investigated to account for this relation. For example, rather than focusing on the pharmacological effects of alcohol, much research has demonstrated that alcohol-related expectancies also engender aggression (for a review, see Quigley & Leonard, 2006). Though expectancy theory has produced robust findings in the alcohol and aggression literature, other research has found evidence to contradict the expectancy-aggression relationship (e.g., Giancola, Godlaski, & Parrott, 2006; Giancola & Zeichner, 1997). Though interesting, exploring all of these factors is beyond the scope of the proposed project. Thus, the following discussion will primarily focus on a widely-accepted

cognitive explanation of the alcohol and aggression relation that has eluded significant empirical investigation – alcohol myopia theory.

Alcohol Myopia Theory

Alcohol myopia theory (AMT) provides a theoretical framework to explain the relation between alcohol intoxication and aggressive behavior. Components of this theory were first introduced by Pernanen (1976) and Taylor and Leonard (1983) and later expanded upon by Steele and Josephs (1990). According to AMT, the pharmacological properties of alcohol impair cognitive functioning in the inebriate by (1) narrowing attentional focus, (2) restricting the range of cues that can be processed, and (3) reducing capacity to process and generate meaning from cues that are processed. Because in most real-world situations cues that instigate behavior are more salient and easier to process than cues that inhibit behavior, intoxication is likely to produce myopia toward cues that instigate behavior (e.g., aggression). However, it is also important to note that alcohol does not “tie us to a roller-coaster ride of immediate impulses arising from whatever cues are salient” on every drunken occasion (Steele & Josephs, 1990; p. 354). Indeed, alcohol intoxication does not facilitate aggression for all persons or for persons in all situations. Thus, as part of AMT, Steele and colleagues put forth the inhibition conflict model and the attention-allocation model to explain *when* and *why* myopia may influence behavior.

Inhibition Conflict. Inhibition conflict (IC) was advanced by Steele and colleagues (Steele & Josephs, 1990; Steele & Southwick, 1985) to elucidate when intoxication is most likely to influence behavior. IC is defined as the conflict that ensues between strong cues that instigate behavior (e.g., a physical provocation) and strong cues that inhibit behavior (e.g., threat of jail). When individuals are intoxicated and faced with competing pressures from both types of cues,

alcohol reduces an individual's ability to cognitively process cues of inhibition which, in turn, allows behavior to be strongly influenced by cues of instigation (Steele & Southwick, 1985). As a result of this effect, aggression is more likely to occur.

Table 1.

Acute Alcohol Intoxication, Inhibition Conflict, and Aggression

		Instigatory Cues	
		Low	High
Inhibitory Cues	Low		
	High		Alcohol ↑ Aggression

Consider, for example, a situation in which an individual receives a rude comment from another individual in a bar. However, the immediate environment also possesses numerous cues that presumably inhibit aggression, such as a formidable provocateur or bouncer standing nearby. If the individual who experienced the provocation is sober, he/she is likely to process both cues of instigation (e.g., rude comment, personal insult) and cues of inhibition (e.g., threat of harm, a bouncer standing nearby) relevant to the situation. On the other hand, if this individual were intoxicated at the time of insult, alcohol's narrowing effect on attention would focus the individual's attention on the salient cues of provocation and impede processing of cues of inhibition (see Table 1). For these reasons, an individual is believed to be more likely to aggress against the provocateur if intoxicated than if sober.

IC has been experimentally supported using the go-no-go stop paradigm in which the IC of intoxicated participants can be observed. Though this paradigm was not specifically designed to measure an effect of alcohol myopia, this protocol has been shown to represent a direct measure of inhibitory control over "go" (i.e., instigation) responses and "stop" (i.e., inhibition)

responses (Logan & Cowan, 1984). For example, Fillmore and Vogel-Sprott (1999) recruited undergraduates to participate in this paradigm using a go-stop choice reaction time task. Participants were asked to focus on a fixation point in the middle of a computer screen and were instructed to respond to a letter that appeared upon its disappearance. On each trial, one of four randomly selected letters appeared on the screen and participants were told to immediately press the key on the keyboard that corresponded with the letter that appeared. This uninterrupted protocol represented the “go” portion of the task.

In order to test for inhibitory control of this “go” response, 27% of the trials incorporated a “stop” signal that was signified by a comfortable level tone emitted from the computer. Upon hearing this tone, participants were instructed to withhold (i.e., inhibit) their responses to the letter that appeared on the screen. Inhibitory control was operationalized as the number of times inhibition occurred in response to the stop signal. Results indicated that intoxicated individuals did not evidence significant impairment in response to “go” signals when compared to their sober peers. However, intoxicated participants did evidence a significant increase in inhibition errors when the “go” and “stop” signals were *both* present. Collectively, the results of this study support the notion that “go” (i.e., instigation) and “stop” (i.e., inhibition) processes do function independently from one another and that alcohol intoxication can impair processing of cues of inhibition (Fillmore & Vogel-Sprott, 1999).

To better understand the IC model, Steele and Southwick (1985) conducted a meta-analysis to examine the effect of IC across several different social behaviors. The meta-analysis reviewed 34 studies that each compared an alcohol group to a control group on a social behavior that involved human interaction (e.g., aggression, self-disclosure) and/or a frequently occurring behavior (e.g., eating, risk taking). Results of the meta-analysis strongly supported the IC model

and found that alcohol facilitated “go” related social behavior to a significantly higher degree under high conflict situations (i.e., situations where competing pressures from both salient cues of instigation and salient cues of inhibition were simultaneously presented) as compared to low conflict situations (i.e., situations where competing pressures from both salient cues of instigation and salient cues of inhibition were not simultaneously presented). Overall, conflict level, alcohol dose, and their interaction accounted for 20% of the variance in alcohol’s effects in these studies, with the high conflict, high alcohol dose groups contributing a disproportionate amount to this effect (Steele & Southwick, 1985).

In a later review, Ito and colleagues (1996) conducted a meta-analysis that, in part, examined the moderating role of IC specific to alcohol-related aggression. In total, 49 studies were reviewed in the analysis, and each study compared an alcohol group to a non-alcohol group (control, placebo, or no drink) on at least one measure of aggression. A primary finding of this meta-analysis revealed that aggression evidenced by sober and intoxicated participants was in fact moderated by IC. In other words, participants who received a high dose of alcohol and faced a high conflict situation reported significantly more aggression than their sober peers.

In addition to physical aggression, IC has also been used to examine the role of alcohol intoxication on other risky behaviors of concern. For example, IC has been tested in several studies examining the role of alcohol in sexual aggression. To observe this effect, Murphy, Monahan, & Miller (1998) assessed the effects of alcohol intoxication on women’s judgments of potential dating partners. Men were described as either attractive or unattractive and as either high risk (e.g., sexually promiscuous and suggested dates in isolated settings) or low risk (e.g., sexually conservative and suggested dates out in public). In accordance with AMT, researchers predicted that alcohol consumption would impair judgment and influence women to ignore the

inhibitory cues of danger and rely on their initial assessment of the man's appearance. Results supported this prediction and indicated that intoxicated women viewed a sexually attractive, high-risk man to be less threatening than sober women. In support of the IC model, these alcohol-related effects were not detected in situations involving an attractive, low risk partner or an unattractive, high risk partner (i.e., low IC).

In a study by Testa, Livingston, & Collins (2000), women who consumed alcohol rated a strange male character more positively, perceived greater positive outcomes for risky behaviors with the male character, and reported a greater likelihood that they would engage in those behaviors. These results suggest that intoxicated women were more focused on sustaining a potential relationship with a man (i.e., cues of instigation) than of protecting their personal safety against potential risk of assault (i.e., cues of inhibition). Furthermore, Davis, George, & Norris (2004) examined the effect of alcohol on women's behavioral responses to unwanted sexual advances. In accordance with the IC model, results of the study indicated that intoxicated women faced with the high-conflict scenario were more likely than sober women to consent to sexual activity and respond passively to unwanted sexual advances.

Attention-Allocation. As posited by Steele and Josephs (1990), the attention-allocation model (AAM) of AMT is a core component in the relation between alcohol and aggression. Steele and Josephs (1990) put forth the AAM as the explanatory mechanism for why alcohol may affect a person differently each time that person drinks alcohol. According to the AAM, alcohol intoxication focuses attention onto whatever is most salient to a person in a given situation. Because in most real-world situations cues that instigate behavior are more salient and easier to process than cues that inhibit behavior, intoxication is likely to produce myopia toward salient cues that instigate behavior (e.g., motivation to aggress) to the exclusion of salient cues

that inhibit behavior (e.g., negative consequences). To help illustrate this effect, the following scenario will provide a concrete example of the AAM and its effects on intoxicated behavior.

Imagine that John is in a bar with his girlfriend Amy. John has had several beers to drink and is actively watching his favorite football team, Ohio State, beat Michigan State, on the bar's television. During the game, the man sitting behind John leans over and starts to flirt with Amy and even places his hand on her shoulder. Though the behavior perturbs John, he does not seem to focus on what this man is doing with his girlfriend because his attention is distracted by the game. Alternatively, imagine the same sequence of events with the exception that the football game was suddenly turned off. Since John's attention is no longer focused on the game, he is more likely to allocate his attention to the man flirting with his girlfriend and, as a result, he is more likely to respond with aggressive action (see Table 2).

Table 2.

The Interactive Effect of Provocation and Distraction on Likelihood of Aggressive Action

		Distraction	
		No	Yes
Provocation	No	Low	Low
	Yes	High	Low/Moderate

To examine the AAM, Steele and Josephs (1988) tested the effects of alcohol on psychological stress. Participants were randomly assigned to one of four groups: alcohol/distraction, alcohol/no-distraction, sober/distraction, or sober/no-distraction. It was expected that the intoxicated participants who were not distracted would report an increase in anxiety prior to giving a speech that detailed what they disliked about their physical appearance. In contrast, it was expected that intoxicated participants whose attention was distracted away

from giving the impending speech would report less anxiety relative to all other groups. The researchers found support for their hypotheses. The intoxicated/distracted participants reported significantly less anxiety than any other group, while the intoxicated/no-distraction participants reported the greatest amount of increase in anxiety relative to the other groups (Steele & Josephs, 1988). Thus, in this high conflict situation, distraction appeared to effectively manipulate alcohol's narrowing effect on attention.

These results were later replicated by Josephs and Steele (1990) who found that intoxicated participants whose attention was moderately distracted reported a decrease in anxiety relative to their intoxicated, non-distracted counterparts (who reported increases in anxiety). Again, sober participants did not report any reduction in anxiety, regardless of whether or not they were distracted. Additionally, this study examined a separate group of intoxicated participants who were mildly distracted prior to the stressful speech. Results indicated that this group did not report a reduction in anxiety (Josephs & Steele, 1990). These data support the AAM and further suggest that the amount of distraction involved in attenuating myopia is important to consider.

Zeichner, Allen, Petrie, Rasmussen, & Giancola (1993) tested the influence of alcohol intoxication and information salience on attention allocation. Specifically, sober, placebo, and intoxicated participants were asked to view positive, negative, and neutral traits that were said to be either relevant or irrelevant to their own personality. All participants were allowed to freely choose which type of word they wanted to view and were not given time restrictions on how long they could view each word. In line with the AAM, it was hypothesized that intoxicated participants who were in the personally relevant personality condition would allocate the greatest amount of attention to threatening cues (i.e., negative information), because these threatening

cues would be most salient to them. Further, participants in the placebo and control conditions were hypothesized to attend to personally salient information longer than personally nonsalient information regardless of word type. Results confirmed these predictions. In accordance with AMT, these findings suggest that intoxicated individuals allocate equal amounts of attentional resources to both salient information and nonsalient information when faced with a situation in which the threat value was low (i.e., positive information). In contrast, intoxicated individuals were found to allocate more attentional resources to salient, relative to nonsalient, information when faced with a situation in which the threat value was high (i.e., negative information).

In summary, acute alcohol intoxication directs attention to the most salient information of a situation (Zeichner, Allen, Petrie, Rasmussen, & Giancola, 1993), this effect can be reduced by distracting attention away from this information (Steele & Josephs, 1988; Josephs & Steele, 1990), and the distraction must be at least moderate in size in order to obtain this effect (Josephs & Steele, 1990). Though these studies advanced scientific understanding of the cognitive effects of acute alcohol intoxication, experimental research was needed to apply this model to actual aggressive behavior. To this end, Zeichner, Allen, Giancola, and Lating (1994) tested the moderating effect of threatening cues on alcohol-related aggression using a laboratory-based aggression paradigm. During the task, participants were led to believe that another subject (a confederate) would provide them with words (that were either negative or positive in nature) that were said to describe their personality based on previously collected data. Participants were told that it was their job to positively shape the confederate's impression of them by administering an electric shock ranging from 1 to 5, with 1 representing the least amount of shock and 5 representing the greatest amount of shock. In this study, shock intensity represented the dependent variable of aggression.

It was hypothesized that intoxicated participants who were faced with threatening personal (i.e., salient negative) information would display more aggression against the confederate (i.e., higher shocks) compared to the group of intoxicated participants who were faced with nonthreatening personal (i.e., nonsalient positive) information. Overall, results supported this hypothesis. Specifically, it was found that intoxicated participants responded more aggressively when faced with salient negative information than when faced with nonsalient positive information. Conversely, sober participants did not evidence a differential response to the two types of personal information and responded with significantly less aggression than the intoxicated participants.

Although this study provided much needed data that linked the cognitive impact of alcohol intoxication on actual physical aggression, it did not specifically test whether this effect could be mitigated by cognitive distraction. To address this gap, Giancola and Corman (2007) conducted a two-part study in which they systematically evaluated the effect of cognitive distraction on intoxicated aggression. In the first study, participants were administered alcohol, presented with a moderate-load cognitive distracter, and participated in a modified version of the Taylor Aggression Paradigm (Giancola & Zeichner, 1995a). Aggression was operationalized as the summation of the intensity and duration of shock a participant administered to a fictitious opponent. In accordance with the AAM, researchers hypothesized that intoxicated participants who received the moderate-load cognitive distracter would display less aggression relative to intoxicated participants who did not receive the distracter or sober participants regardless of their distraction condition. In this way, the AAM was used to predict a situation in which alcohol would supposedly *decrease* aggression as opposed to increase aggression. As expected, the moderate-load distracter was successful in attenuating intoxicated aggression for inebriated

individuals. In fact, intoxicated, distracted participants evidenced *less* aggression than the non-distracted participants who received a placebo beverage. In accordance with prior research (Steele & Josephs, 1988; Josephs & Steele, 1990), this finding suggests that distraction can drive attention away from salient/provoking stimuli and, consequently, *decrease* aggressive behavior.

The second part of the study attempted to assess the effects of different levels of cognitive load on intoxicated aggression. Consistent with prior research (Joseph & Steele, 1990), it was predicted that a moderate cognitive load would be the most effective level of distraction for allocating attention away from provocative/salient cues. To test this effect, intoxicated and placebo participants were randomly assigned to one of five working memory groups. The level of distraction ranged from no distraction to having to remember and respond to 8 sequences of a memory task. Consistent with Josephs and Steele (1990), results indicated that distraction was an important factor in the suppression of aggression. Specifically, the moderate distracter (i.e., holding four sequences in working memory) proved to be optimal for reducing intoxicated aggression. In addition, participants who received no distraction and participants who received the highest level of distraction (i.e., holding eight sequences in working memory) displayed the most aggression of all groups. This result is consistent with Josephs and Steele (1990), who proposed that high-level distracters may elicit frustration and engender aggression. Alternatively, Giancola & Corman (2007) also acknowledged the possibility that highly distracted participants may have given up on the working memory task and reallocated attention to the aggression task. It was also clear from the results that low-level distraction may not be strong enough to relocate attention away from provocation.

Furthermore, Giancola and Corman (2007) also examined participants' reaction times on the TAP during both parts of the study. Results from the first study indicated that participants

assigned to the distraction group evidenced significantly slower reaction times than participants assigned to the no distraction group. Moreover, results of the second study indicated that all distracted participants evidenced significantly slower reaction times compared to participants in the no distraction group, though low, moderate, and highly distracted participants did not significantly differ from each other on reaction time (Giancola & Corman, 2007). This main effect provides evidence that distracters constituted a so-called “cognitive load” that may have contributed to participants’ allocation of attention away from the reaction time task (and the adversarial interaction). However, although all distracters tax attentional resources, it appears that the use of a moderate distracter most effectively attenuates alcohol-related aggression by allocating attention away from provocation.

Though this study established that the AAM can be offered as an explanation for intoxicated aggression, the specific attentional processes that underlie this effect have yet to be examined. Thus, it remains unclear whether intoxicated participants’ attention is undoubtedly drawn to aggression stimuli under provocative situations. In addition, it is not known whether this effect can be impacted by the disruption of working memory (i.e., attention-allocation). Accordingly, future research is needed to examine further the cognitive underpinnings of this effect.

Attentional Bias and Aggression

Dot Probe Task and Attention-Allocation. The idea that attention is shifted to mood-congruent stimuli has been a long standing concept in cognitive psychology. Numerous studies have found evidence to suggest a mood-congruent attentional bias to a number of stimuli, such as alcohol and drug cues, affect-related cues (e.g., threatening or sad faces), and aggression-related words (e.g., Cohen, Eckhardt, & Schagat, 1998; Duka & Townshend, 2004; Ehrman et al., 2002;

Jongen, Smulders, Ranson, Arts, & Krabbendam, 2007; MacLeod, Mathews, & Tata, 1986; Smith & Waterman, 2003; Smith & Waterman, 2004; Townshend & Duka, 2001). This bias in attention is typically measured by assessing an individual's reaction times to semantic or pictorial stimuli presented on a computer screen, with the dependent variable representing reaction times to the stimuli of interest. Though there are numerous methods of testing this effect, the dot probe task has proven to be an effective tool in the study of attention allocation to perceptually salient stimuli (reviewed in Mogg & Bradley, 1998; Mogg & Bradley, 1999; MacLeod, Mathews, & Tata, 1986).

The dot probe task (DPT), developed by MacLeod, Mathews, and Tata (1986), is a direct visual test of attention allocation. This task was developed, in part, to accommodate for the interpretative difficulties and unexpected findings that have surrounded the Stroop task in past years (Mogg & Bradley, 1998). In a typical version of the task with semantic stimuli, a fixation marker (e.g., an "X") is presented on a computer screen for a set period of time and is followed by two words, one above the other. On critical trials, one word represents the stimulus of interest (e.g., fear) and is paired with a matched neutral word (e.g., fork). Immediately following the disappearance of each word pair, a small dot randomly appears in the location of one of the words. Participants are typically instructed to press the button that corresponds to the dot location as quickly as possible. Attention allocation to the stimulus word is measured by the reaction time to the dot, with faster reaction times occurring when the dot replaces the stimulus word and slower reaction times occurring when the dot replaces the neutral word. This effect presumably reflects an attentional shift to the stimulus theme of interest (Mogg & Bradley, 1998). In recent years, the DPT has been modified to simplify task requirements (e.g., use of arrow probes instead of dot probes). These modifications have helped to facilitate research with

populations that are more difficult to test (e.g., children, intoxicated individuals) (reviewed in Mogg & Bradley, 1999)

Previous work with the DPT and its various modifications (reviewed in MacLeod, Soong, Rutherford, & Campbell, 2007; Mogg & Bradley, 1999) has provided evidence to suggest that it is a reliable measure of attentional biases between clinical versus non-clinical samples (e.g., MacLeod et al., 1986), as well as experimentally primed versus control samples (reviewed in Matthews & MacLeod, 2002; Fox & Knight, 2005). However, past research has also found that the DPT is not a reliable measure of attentional biases of unprimed non-clinical samples (Schmukle, 2005). From these data, it is clear that non-clinical samples must undergo experimental state activation (i.e., priming) in order to evidence significant attention allocation biases. In social psychological research, priming is often used to induce an automatic influence on cognitions and behaviors (Todorov & Bargh, 2002). For example, in a typical priming experiment, participants are exposed to stimuli (e.g., written insult) that are associated with the construct under investigation (e.g., aggression) and subsequently tested in an experiment that examines the role of the priming stimuli on the outcome variable of interest. Accordingly, this technique is clearly a critical part of the methodology of dot probe studies when clinical samples are not used.

Attention-Allocation and Aggression. Historically, the DPT and other cognitive tests of attention have measured biases related to emotional disorders (e.g., threat bias in trait anxiety) (reviewed in Mogg & Bradley, 1998). However, these tests have recently been utilized in aggression research as well (Cohen, Eckhardt, & Schagat, 1998; Eckhardt & Cohen, 1997; Smith & Waterman, 2003; Smith & Waterman, 2004). Eckhardt and Cohen (1997) proposed that anger-related stimuli have not been studied with cognitive tests in the past due to a lack of

diagnostic criteria for “anger” disorders and difficulty selecting participants who meet criteria for this uncertain diagnosis. However, Smith and Waterman (2003) contended that anger is a ubiquitous emotion that can be studied in both clinical and non-clinical samples. Smith and Waterman (2003) further noted that it is necessary to make a clear distinction between the “normal” control population and participants in the “normal” control population who report significant anger difficulties (i.e., trait anger). Accordingly, recent research has begun to examine the role of trait anger in attentional processes to anger information.

For instance, Eckhardt and Cohen (1997) used a modified emotional Stroop task to assess the effect of a naturalistic insult on attentional biases among low and high trait anger individuals. To activate state anger, participants were insulted by a confederate who impeded their pathway while walking to the experimental room by pushing a filing cabinet drawer into their way. Upon participants’ second attempt to pass by, the confederate slammed the drawer back into the filing cabinet and shouted an insult at the participant as they left. Following the insult, participants then completed the modified emotional Stroop task in which they were presented with a target color prior to each trial and asked to indicate whether the presented word (i.e., anger word, positive emotion word, or neutral word) was the same color as the target color. As expected, insulted participants high in trait anger took longer to respond to the color of anger words as compared to positive emotional and neutral words. In contrast, non-insulted high trait anger participants and all low trait anger participants did not evidence this effect. Using similar methodology, this effect was replicated in a separate investigation using a visual search task (Cohen, Eckhardt, & Schagat, 1998).

Smith and Waterman (2003) tested violent offenders, nonviolent offenders, and undergraduate participants’ attentional biases to anger-related semantic stimuli using both a DPT

and an emotional Stroop task. Though it was expected that the violent offenders would display a perceptual bias toward the aggression words, high trait aggressive undergraduates were also expected to display a similar attentional bias to aggression words. Results confirmed these predictions. Compared to the non-aggressive undergraduates and nonviolent offenders, both aggressive groups displayed significant attentional biases toward the aggression, as opposed to the neutral, words on the DPT. Likewise, compared to the low trait aggressive undergraduates and nonviolent offenders, both aggressive groups displayed significant attentional biases toward the aggressive and negative emotional words, as compared to the positive emotional and neutral words, on the emotional Stroop task.

Later, Smith and Waterman (2004) replicated this effect when they again compared the attentional biases of violent offenders, nonviolent offenders, and undergraduates. However, in this study participants engaged in a themed DPT as well as a visual search task. In the themed DPT, researchers created state activation by priming participants with a series of written vignettes that were either aggressive or neutral in theme. Participants then engaged in a DPT in which they responded to words (either aggression or neutral) that had previously appeared in the text. Researchers posited that aggression-prone participants' attention would be drawn to the aggression words in spite of the fact that the neutral words were also familiar to the participants. Results supported an attentional bias toward aggression words for violent offenders and high trait aggressive undergraduates as compared to nonviolent offenders and low trait aggressive undergraduates.

Overview of the Proposed Study and Hypotheses

The preceding review has established that AMT is a well-established cognitive theory to explain alcohol's effects on social behaviors of public concern (e.g., risky sex, drunk driving,

anxiety/stress). Despite the attention this theory has received, a paucity of research has been conducted to examine directly this theory in relation to alcohol-related aggression. In addition, no known study to date has directly examined the specific cognitive underpinnings of the attentional processes that are presumed to underlie this effect.

As established, the AAM of AMT asserts that intoxication facilitates the focus of attention onto the most salient, provocative cues of a situation, and consequently diminishes the impact of less salient inhibitory cues that signal the regulation of risky behavior (Steele & Josephs, 1988; Steele & Josephs, 1990). Previous research has suggested that, in high conflict situations, an intoxicated individual may become more aggressive due to the myopia that ensues as a result of acute alcohol intoxication (Steele & Josephs, 1990; Taylor & Leonard, 1983; Zeichner & Phil, 1979). This hypothesis has been supported by several studies that have established that acute alcohol intoxication directs attention to the most salient information of a situation (Zeichner, Allen, Petrie, Rasmussen, & Giancola, 1993), that this effect has direct implications for physical aggression (Zeichner, Allen, Giancola, & Lating, 1994), that distraction can drive attention away from this information (Steele & Josephs, 1988; Josephs & Steele, 1990), and that using a moderate level distracter is effective in attenuating aggression (Giancola & Corman, 2007; Josephs & Steele, 1990). Although this research has supported AMT and greatly contributed to the understanding of alcohol-related aggression, no-known study to date has overtly measured the cognitive underpinnings of the AAM.

As such, the purpose of the present study was threefold. The first goal (1) was to examine the effects of alcohol and distraction on attention to anger/aggression-related stimuli among provoked individuals using a visual probe task (VPT). Past literature has confirmed that the VPT is a direct visual test of attention allocation (reviewed in MacLeod, Mathews, & Tata,

1986; MacLeod, Soong, Rutherford, & Campbell, 2007; Mogg & Bradley, 1998, 1999). In addition, pertinent research has confirmed the reliability of this task (Fox & Knight, 2005; MacLeod et al., 1986; Mathews & MacLeod, 2002). The second goal (2) was to test behaviorally the effects of alcohol and distraction on aggression among provoked individuals using a version of the Taylor Aggression Paradigm (TAP) (Giancola & Zeichner, 1995a). Pertinent literature has established that the TAP is a direct measure of physical aggression (Giancola & Parrott, 2008). This part of the study was intended to replicate and extend past research that has found a similar effect (Giancola & Corman, 2007). The third goal (3) was to examine whether biases in attention allocation to anger/aggression-related stimuli on the VPT were associated with concomitant increases in aggression. Indeed, alcohol should bias attention toward anger/aggression-related stimuli to the greatest extent among provoked, non-distracted individuals relative to provoked, distracted individuals. These biases were expected to correspond directly to subsequent aggressive behavior.

Participants were randomly assigned to one of two beverage conditions (i.e., alcohol, no-alcohol control) and one of two distraction conditions (i.e., moderate distraction, no-distraction). In addition, all participants were provoked via reception of electric shocks and a verbal insult from a fictitious male opponent. In accordance with the reviewed literature, the overarching hypothesis of this study contended that, relative to all other groups, the intoxicated, distracted participants would display the lowest levels of aggressive behavior and that this effect would be mediated by attentional bias to anger/aggression words. This association was not expected to emerge for any other experimental group. As put forth by Muller, Judd, and Yzerbyt (2005) three hypotheses were advanced consistent with an effect of mediated moderation:

Hypothesis 1. Distraction condition was expected to moderate the relation between alcohol consumption and aggressive behavior. Specifically, participants in the intoxicated, distracted group were expected to display the lowest levels of aggression relative to participants in the intoxicated, non-distracted group or participants in the no-alcohol control groups.

Hypothesis 2. Distraction condition was expected to moderate the relation between alcohol consumption and attentional bias toward anger/aggression words, relative to neutral words. Specifically, participants in the intoxicated, distracted group were expected to display the lowest attentional bias for anger/aggression words relative to participants in the intoxicated, non-distracted group or participants in the no-alcohol control groups.

Hypothesis 3. Among participants in the intoxicated, non-distracted group, attentional bias toward anger/aggression words was expected to predict higher levels of subsequent aggressive behavior. No such relation was expected in the other three experimental conditions.

METHOD

Recruitment Procedures and Eligibility Criteria

Prior to data collection, this study was approved by the university's Institutional Review Board. Participants were recruited from the local metro-Atlanta community and responded to an advertisement stating "Researchers at Georgia State University seeking males age 21-35 for study of alcohol's effect on behavior. Earn between \$30 and \$100. Please call 404-413-6199 for more information." This advertisement was posted on internet resources (e.g., job classifieds) and was placed in local-area newspapers. Participants contacted the laboratory by telephone and completed a telephone screening interview with laboratory staff to determine eligibility for participation. In order to be eligible, participants had to report that they (1) were regular social drinkers (defined as consuming an average of two or more standard alcohol drinks per occasion, an average of twice per month or more, for the past year) (National Institute on Alcohol Abuse and Alcoholism, 2003), (2) were not problem drinkers as defined by a score of 6 or higher on the Brief Michigan Alcoholism Screening Test (B-MAST; Pokorny et al., 1972), (3) did not have a current or a lifetime DSM-IV diagnosis of any substance use disorder (other than caffeine or nicotine), (4) had never sustained a traumatic brain injury that required medical attention, (5) had never been diagnosed with a psychiatric disorder (e.g., psychotic disorder, major depression), (6) did not currently have a significant medical health problem, (7) were not currently taking any medication that might contraindicate the use of alcohol, (8) were native English speakers, and (9) did not know anyone who has participated in the study before. In addition, in order to ensure tolerance for our dose of alcohol (.99 g/kg of 95% alcohol) without any danger of adverse effects or excessively high blood alcohol concentrations, all participants were required to be less than 200 pounds in weight.

Upon completion of the telephone interview, participants were contacted within 1-2 business days regarding their eligibility. Participants who did not meet criteria for eligibility were notified and thanked for their time. Eligible participants were (1) read a standardized description of the protocol, (2) told that they may or may not receive alcohol during the experiment, and (3) scheduled for an experimental appointment. To ensure that the experimental methodology was not compromised, the true nature of the study was not divulged to participants at this time. Indeed, informing subjects of the true nature of the study could have elicited artificial, socially desirable (e.g., non-aggressive) responses. Rather, participants were told that they would partake in both a visual speed task (i.e., VPT) and a competitive reaction time task (i.e., TAP) to assess alcohol's effects on motor attention.

Participants and Experimental Design

Participants were 276 men between the ages of 21-35 who presented to the laboratory for an experimental appointment. Of these men, 76 were deemed ineligible based on pre-determined screening criteria (described above).

The remaining 200 participants were randomly assigned to one of four experimental groups: alcohol-distraction, alcohol-no-distraction, sober-distraction, and sober-no-distraction. Because past research suggests that the effects of alcohol expectancy on aggression are negligible (e.g., Bushman & Cooper, 1990; Hull & Bond, 1986; Steele & Southwick, 1985), such influences were not expected to impact aggression in the proposed study. Moreover, placebo groups are not ecologically valid; placebo beverages are not consumed in most "real world" settings. As such, a no-alcohol control group, rather than a placebo group, was utilized. Overall, the proposed study included two categorical predictor variables (beverage, distraction), one

continuous predictor variable (attentional bias scores), and one nuisance variable (probe location).

Materials

Questionnaires. Participants completed eligibility screening measures on paper that included a *Medical History Questionnaire* that assessed medical conditions that might contraindicate safe consumption of alcohol; the *Symptoms Checklist-09-Revised* (SCL-90-R; Derogotis, 1983) which assessed psychiatric symptomatology; and the *Brief Michigan Alcoholism Screening Test* (B-MAST; Pokorny, Miller, & Kaplan, 1972) which assessed symptoms of problem drinking. In addition, participants were administered the following questionnaires on a computer via MediaLab 2000 (Empirisoft Research Software, Philadelphia, PA): (1) a *Demographic Form* assessed age, ethnic background, race, highest level of education, and income level; (2) a *Drinking Patterns Questionnaire*, which was derived from the National Institute on Alcohol Abuse and Alcoholism's (NIAAA, 2003) recommended set of six alcohol consumption questions. Of interest to the present study, frequency of alcohol consumption was assessed with the question, "During the last 12 months, how often did you usually have any kind of drink containing alcohol?" A categorical response ranging from "everyday" to "I never drank alcohol in my whole life" was provided. In addition, average quantity of alcohol consumption during the past year was assessed with the question, "During the last 12 months, how many alcoholic drinks did you have on a typical day when you drank alcohol?" A categorical range of responses from "1 drink" to "25 or more drinks" was provided. In accordance with the guidelines put forth by NIAAA, total scores were obtained by computing the average number of drinks in each range. This strategy reliably assesses an individual's average quantity of alcohol consumption per drinking day over a specific period of time (for a review, see Sobell & Sobell,

1995); and (3) the *Aggression Questionnaire* (AQ; Buss & Perry, 1992), which measured trait physical aggression. The AQ is a 29-item, Likert type measure comprised of four subscales (physical aggression, verbal aggression, anger, and hostility). In the present study, only the Physical Aggression subscale was analyzed to identify group differences that could potentially confound laboratory-based physical aggression. Participants rate how each item describes them on a scale of 1 (extremely uncharacteristic of me) to 5 (extremely characteristic of me). The AQ has been shown to have high validity and reliability ($\alpha = .80$). A Cronbach alpha coefficient of .78 was obtained for the Physical Aggression subscale in the present sample.

Attentional bias. A modified dot probe task, referred to herein as a visual probe task (VPT), was used to assess attentional bias to anger/aggression relative to neutral themed words. Previous work with this task and its various modifications (reviewed in MacLeod, Soong, Rutherford, & Campbell, 2007; Mogg & Bradley, 1999) has provided evidence to suggest that it is a reliable measure of attentional biases between clinical versus non-clinical samples (e.g., MacLeod et al., 1986), as well as experimentally primed versus control samples (reviewed in Matthews & MacLeod, 2002; Fox & Knight, 2005).

During the VPT, participants were seated facing a computer monitor and keyboard. Participants were instructed to “hover” the index finger of their dominant hand over the down arrow key in a “ready” position throughout the task. To ensure participants only used their index finger during the task, a rubber band was placed around participants’ remaining fingers. After reading a set of directions and indicating that they were ready to begin, a fixation “x” was presented on the computer screen for 500 ms. Two words then appeared on the screen, one above the other. After 500 ms, the words disappeared and either a left-facing arrow or right-facing arrow appeared in the location of one of the words. Participants were instructed to press

the left arrow key on the keyboard if a left-facing arrow replaced the word or to press the right arrow on the keyboard if a right-facing arrow replaced the word. Participants were directed to respond as quickly and as accurately as possible. Prior to completing the critical trials of the task, participants were given 20 practice trials with neutral word pairings to account for decreases in response latencies during initial trials (Forbach, Stanners, & Hochhaus, 1974).

There were a total of 116 trials. These trials consisted of 52 aggression-neutral word pairings and 24 anger-neutral word pairings for a total of 76 anger/aggression-neutral word pairings. In addition to this, there were 40 neutral-neutral word pairings to mask the theme of the study. The task was configured to ensure that the probes appeared an equal number of times in both the upper and lower word locations and replaced the type of word (i.e., stimulus or neutral) an equal number of times. In addition, the direction of the arrow (i.e., left-facing, right-facing) appeared an equal total number of times and appeared equally within each condition (for more detail, see Appendix 1).

Pilot testing of stimulus words was conducted to select words that most accurately reflected the definitions of anger and aggression. Anger was defined as “An emotional state that can vary in intensity, from mild annoyance to rage. The experience of anger lacks a specific goal.” Aggression was defined as “A behavioral process that includes the goal of inflicting harm to another living being (i.e., not to an inanimate object) who is motivated to avoid the act.” These definitions have been shown to accurately reflect the two constructs (Parrott & Giancola, 2007). Seventy nine words consistent with these definitions were obtained from three sources that have previously aggregated emotionally salient words from the English language (Bradley & Lang, 1999; Clore et al., 1987; Smith & Waterman, 2003). Each word was rated on a 5-point Likert-type scale (1 = anger, 3 = neutral, 5 = aggression) by nineteen male psychology graduate

students who were unaware of the study's hypotheses. From these words, 76 words were selected for use in the present study (see Appendix 2) based on the extent to which each represented an "anger" or "aggression" word (i.e., the word obtained a score below 3 or above 3 in either respective condition). Each neutral word was matched to each anger/aggression word in terms of word frequency (Kucera & Francis, 1967) and first letter. In addition, each neutral word was matched to each anger/aggression word in terms of syllabic length in order to ensure that word length did not confound the results. Moreover, past research has shown that latency decreases and accuracy increases when words are repeated within the same task (Grant & Logan, 1993). Thus, each word pairing was only presented once during the task.

Physical aggression. A modified version (Giancola & Zeichner, 1995a) of the Taylor Aggression Paradigm (TAP; Taylor, 1967) was used to assess direct physical aggression. Participants competed in a reaction time task where electrical shocks were administered to and received from a "fictitious" opponent (for more information, see "Deception Manipulation" below). Participants were seated at a table in a small room. On the table facing participants was a computer screen and keyboard. The numbers "1" through "10" on the computer keyboard were labeled from "low" to "high" to allow participants to determine varying levels of shock to administer. Participants received visual feedback on the computer monitor indicating whether they "won" or "lost" the trial as well as the shock level selected and received. A Precision Regulated Animal Shocker (Coulbourn, Allentown, PA) was used to generate the shocks. The computer software that controlled the task was developed by Vibranz Creative Group (Lexington, KY). Physical aggression was defined as the summation of standardized scores for the average intensity and duration of shocks selected. The Taylor task and other similar shock-

based laboratory paradigms have been repeatedly shown to be safe and valid measures of aggressive behavior (e.g., Anderson & Bushman, 1997; Giancola & Parrott, 2008).

Distraction task. While engaged in the VPT and TAP, participants in the distraction condition also attended to a computerized memory sequencing task on a laptop computer located to the left of their desktop computer. In this task, a 3 x 3 matrix of 2-cm light-gray squares were presented on a white computer screen. On each trial, four squares illuminated (in black) in a random sequencing order. Participants were asked to attend to, memorize, and click (using the laptop keypad) the sequencing order of each trail. The trials proceeded continuously regardless of whether the participant responded to the sequence and, in order to prevent confounding emotional responses, performance feedback was not provided. During the VPT, the computer program instructed participants to stop the task at intermittent intervals so that they could attend to trials of the distraction task; no-distraction condition participants were instructed to stare at a blank screen during the intermittent breaks. After a pre-determined period of time, the experimenter instructed participants (via the intercom) to press the spacebar to resume the task. During the TAP, the program did not stop to allow participants to attend solely to the distraction task at intermittent intervals; rather, it was left up to individual participants to decide how they wished to allocate their time between the two tasks. In order to ensure participants actively engaged in the task, distraction condition participants were told that they would receive an additional \$30 if they performed better than 80% of subjects who have already been tested. In reality, all subjects were paid the same amount of money. Previous research using similar methodology has confirmed the reliability of this task as a moderate-level distracter (Giancola & Corman, 2007).

Deception Manipulation

To disguise the true aims of the study, participants were told that the purpose of the study was to examine alcohol's effects on motor attention using both a visual speed task (i.e., VPT) and a competitive reaction time task (i.e., TAP). In order to convince participants that they were competing against another person, participants completed a demographic interview in which they answered several basic questions about themselves (e.g., first name, favorite food). This interview was ostensibly videotaped by the experimenter and participants were told that the purpose of the videotape was to give their opponent a better idea of who they were competing against. Likewise, participants were told that they would also be able to view their opponent's answers as well. In actuality, participants viewed a pre-recorded tape of a male opponent (a confederate) of the same race.

Additionally, participants were informed that they would undergo a pain threshold assessment prior to the reaction time task. To facilitate deception, participants heard their "opponent's" pre-recorded pain threshold assessment responses over the intercom system before they completed their pain threshold assessment. Presentation of the demographic interview tape as well as the male's voice during the pain threshold assessment maximized the likelihood that participants were convinced they were competing against another person in the study. Indeed, much research has confirmed the success of this manipulation (e.g., Parrott & Zeichner, 2005; Parrott & Giancola, 2004).

Beverage Administration

Participants were randomly assigned to consume an alcoholic or non-alcoholic beverage. Participants in the Alcohol group were administered two drinks consisting of an overall dose of 0.99 g/kg body weight of 95% ethanol USP mixed in a 1:5 ratio with Tropicana orange juice. This dose is equivalent to approximately 3-4 mixed drinks that would be served in a bar. The

beverage was poured into two glasses in equal quantities. This single alcohol dose has been used in past studies of alcohol-related aggression and has reliably produced breath alcohol levels between .08%-.12%, which is within NIAAA safety guidelines for the social drinkers under investigation. Because this dose has been shown to consistently potentiate aggressive behavior (e.g., Giancola, et al., 2002; Giancola & Zeichner, 1997; Parrott & Zeichner, 2002), it was chosen because it maximized the likelihood of producing an alcohol-facilitated effect on physical aggression. In addition, this dose provided intoxication levels sufficient for measuring attentional biases toward anger/aggression words in participants. Participants in the No-Alcohol control group received an isovolemic beverage consisting of orange juice only.

All beverages were served chilled with no ice. Twenty minutes was allotted for beverage consumption. Participants were given their two glasses at equally-spaced time intervals (i.e., 10 minutes) during the twenty minute interval to control for rate of drinking. Immediately following beverage consumption, all participants rinsed their mouths with water. Breath Alcohol Concentrations (BrAC) for participants in the Alcohol group were assessed with the Alco-Sensor IV breath analyzer (Intoximeters, Inc., St. Louis, MO) every five minutes after finishing their beverages. The practice trials of the TAP (for a detailed description, see “Provocation” below) commenced after participants reached .08% on the ascending limb of the BAC curve, where the stimulating effects of alcohol are most likely to be produced (Addicott et al., 2007; Giancola & Zeichner, 1997; Martin et al., 1993).

Provocation

Pertinent literature suggests that response biases to cognitive tasks can only be effectively measured in clinical samples or in state-activated subjects (MacLeod, Mathews, & Tata, 1986; Schmukle, 2005). Thus, participants received physical and verbal provocations from their

opponent in order to elicit anger and make provoking interpersonal cues extremely salient. To accomplish this, participants engaged in “practice” trials of the TAP with the fictitious opponent prior to the VPT. The practice trials were rigged such that the participant “lost” a disproportionate number of trials (i.e., 4 out of 6). In addition, the “opponent” delivered the highest possible shock intensity (i.e., 10’s) to the participant on each of these four trials. At the end of these practice trials, participants were allowed to give their opponent verbal feedback regarding their performance. In particular, participants and their opponent were told that the feedback they provide to their opponent should represent constructive criticism that would not derogate their competitor. After providing feedback to their opponent, participants received the following feedback from their opponent: “Well, he was really slow, I mean mentally slow. This guy must be a real idiot or something. I mean, I messed up on some of those trials and still won! Now that I've got the hang of it, I think I can pretty much beat him every time, which will be great because I want to keep nailing him with tens!” This message was pre-recorded by a confederate (matched to race) and was played through a closed-circuit intercom system.

Procedure

Upon arrival to the laboratory, participants were greeted by an experimenter and led to a private room. At this time, participants were asked to present a picture ID and informed consent was obtained. Participants’ breath alcohol concentration (BrAC) and weight were assessed to confirm sobriety and weight eligibility requirements. Participants with a BrAC above .00% were prohibited from completing the study on that day and asked to reschedule. Participants whose weight exceeded eligibility requirements were not permitted to complete the experimental portion of the study.

Participants then completed screening measures as well as a questionnaire battery using MediaLab 2000 software (Empirisoft Research Software, Philadelphia, PA). Additional questionnaires were also completed but are unrelated to the current study and are thus not reported here. The experimenter provided instructions on how to operate the computer program that administered the questionnaire battery. S/he was also available to answer any questions during the session. After participants completed the questionnaire battery, participants who were deemed ineligible were paid, debriefed, and thanked for their time. Eligible participants were randomly assigned to one of the four experimental conditions and were informed of their beverage condition. Participants in the alcohol condition were required to give their keys (if they were carrying keys) and valid picture ID (e.g., a driver's license) to the experimenter with the understanding that these items would be returned at the end of the study upon reaching a BrAC of 0.03% and passing a field sobriety test. A field sobriety test was conducted at this time to establish participants' baselines.

Next, participants were escorted to an experimental room where the remainder of the study took place. While en route to the experimental room, the experimenter pointed to both the opponent's room and the participants' room and stated "this is the room where your opponent will complete his tasks today, and this is the room where you will complete your tasks today." The opponent's room was adjacent to the participants' room. Participants were seated at a desk with a computer monitor and a keyboard and were informed that, as part of the study, they were going to individually complete a visual speed task (i.e., VPT) and additionally partake in a competitive reaction time task (i.e., TAP) against another participant (a male confederate) in the study. Participants were told that the rest of the study was going to take place in the current room and were shown how to communicate with the experimenter via the intercom if they

required assistance during the study. Next, participants completed the demographic interview and the experimenter left to “meet with the opponent.”

After the experimenter returned to the participants’ room, participants were shown the electrodes that would administer the shocks during the TAP and were given instructions on how to perform the VPT, TAP, and the Distraction Task (if in the distraction condition). Participants were told that they would practice the VPT and Distraction Task during beverage consumption.

Participants then received their assigned beverages and the beverage administration procedures commenced. During the first ten minutes of beverage consumption, all participants engaged in the practice trials for the VPT (i.e., 20 neutral-neutral words pairings). During the second ten minutes of beverage consumption, distraction condition participants practiced the Distraction Task.

Following beverage consumption, the experimenter conducted the pain threshold assessment. Following the pain threshold assessment (and upon reaching a BrAC of .08% for alcohol participants), participants were shown the 20 second video of their “opponent” answering several demographic questions (see above). Following the demographic interview, all participants completed the “practice” trials of the TAP. These practice trials took participants approximately 2-3 minutes to complete.

Upon completing these trials, participants were asked to provide constructive oral feedback (via a closed-circuit intercom system) to their opponent. The actual purpose of these TAP trials was to introduce provoking cues of instigation to participants. Thus, after participants provided feedback to their opponent, all participants received negative verbal feedback from their opponent (described above). Immediately after receipt of the opponent’s feedback, participants were instructed that they would complete the visual speed task (i.e., the VPT). All

procedures for the VPT remained the same for both the distraction and no-distraction groups. However, participants in the distraction groups simultaneously engaged in the cognitive Distraction Task (see Distraction task). Immediately after completing the VPT, participants completed the experimental TAP trials (in their distraction conditions). The TAP methodology was the same for all groups. However, participants in the distraction condition engaged in the same distraction task while completing the TAP (see Distraction task).

The TAP procedure consisted of 20 reaction time trials (10 wins and 10 losses). For each trial, participants were informed that shortly after the words “Get Ready” appeared on the screen, the words “Press the Spacebar” would appear at which time they had to press, and hold down, the spacebar. Following this, the words “Release the Spacebar” would appear at which time they had to lift their fingers off of the spacebar as quickly as possible. A “win” was signaled by the words “*You Won. You Get to Give a Shock*” and a “loss” was signaled by the words “*You Lost. You Get a Shock.*” A winning trial allowed participants to deliver a shock to their opponent and a losing trial resulted in receiving a shock from their opponent. Participants were told that they had a choice of 10 different shock intensities to administer at the end of each winning trial for a duration of their choosing. Participants could not elect to not shock their opponent. However, participants were told that shock button “#1” would deliver a low intensity shock that is best characterized as “very mild” and “definitely not painful.” On losing trials, participants received shocks from their “opponent” that were one second in duration and ranged from 90% (an “8”) to 100% (a “10”) of the highest tolerated shock intensity. Following all trials, a specially designed “volt meter” and the illumination of one of the 10 “shock lights” [ranging from 1 (low) to 10 (high)] on the computer screen signaled to the participant the shock that he or the opponent selected. In actuality, reaction time was not measured and the competitive task was used to lead

participants to believe that they were engaging in an adversarial interaction with another individual. A randomly generated win/loss sequence was predetermined and incorporated into the computer program that executed the task. All participants received the same sequence. A computer controlled the initiation of trials, administration of shocks to participants, and recording of their responses. This task took approximately 10 minutes for no-distraction participants to complete and approximately 15-20 minutes for distraction participants to complete. After completion of the TAP, the experimenter entered the room and obtained a post-TAP BrAC reading.

Debriefing and Compensation

In order for aggression data to be valid, participants must believe that they were competing against another individual on a “reaction time” task and that this task was not a measure of aggression. Deception status was confirmed by administration of a brief verbal interview prior to the debriefing of participants. Specifically, participants were asked whether or not they thought the task was a good measure of reaction time. Additionally, participants were asked to verbally provide an “impression” of their opponent and comment on whether they thought their opponent was “reasonable.”

After assessing deception status, participants were told that the purpose of the study was to measure the effects of distraction on alcohol-related cognitive attention and physical aggression. Participants were told that at no time during the procedure did they actually administer an electric shock to anyone, and that their responses were “normal” and consistent with those of others in the study. They were also informed that they were not told, at the beginning of the study, that the TAP was a measure of aggression because many people artificially alter their responses if they are aware of this information. Likewise, they were told

that the purpose of the VPT was to measure their attention to anger/aggression-related words. To mitigate the likelihood that subjects felt intellectually inadequate because they were deceived by the manipulations, they were told that 95% of the participants in this project were similarly deceived and that being deceived is completely “normal.” Questions and concerns were addressed. At this time, sober participants were thanked, paid for their time, and allowed to leave the laboratory.

However, alcohol participants were required to remain in the laboratory until their BrAC fell below 0.03% on two consecutive readings (in accordance with NIAAA guidelines) and were able to pass a field sobriety test with a score equivalent to (or better than) baseline. At that time, participants were thanked and paid for their time. To minimize the possibility that subjects drove a motor vehicle after leaving the laboratory, participants were transported home by a friend/family member or were escorted to the Georgia State University MARTA station by a member of the laboratory. For a graphical depiction of the procedure for this study, refer to Figure 1.

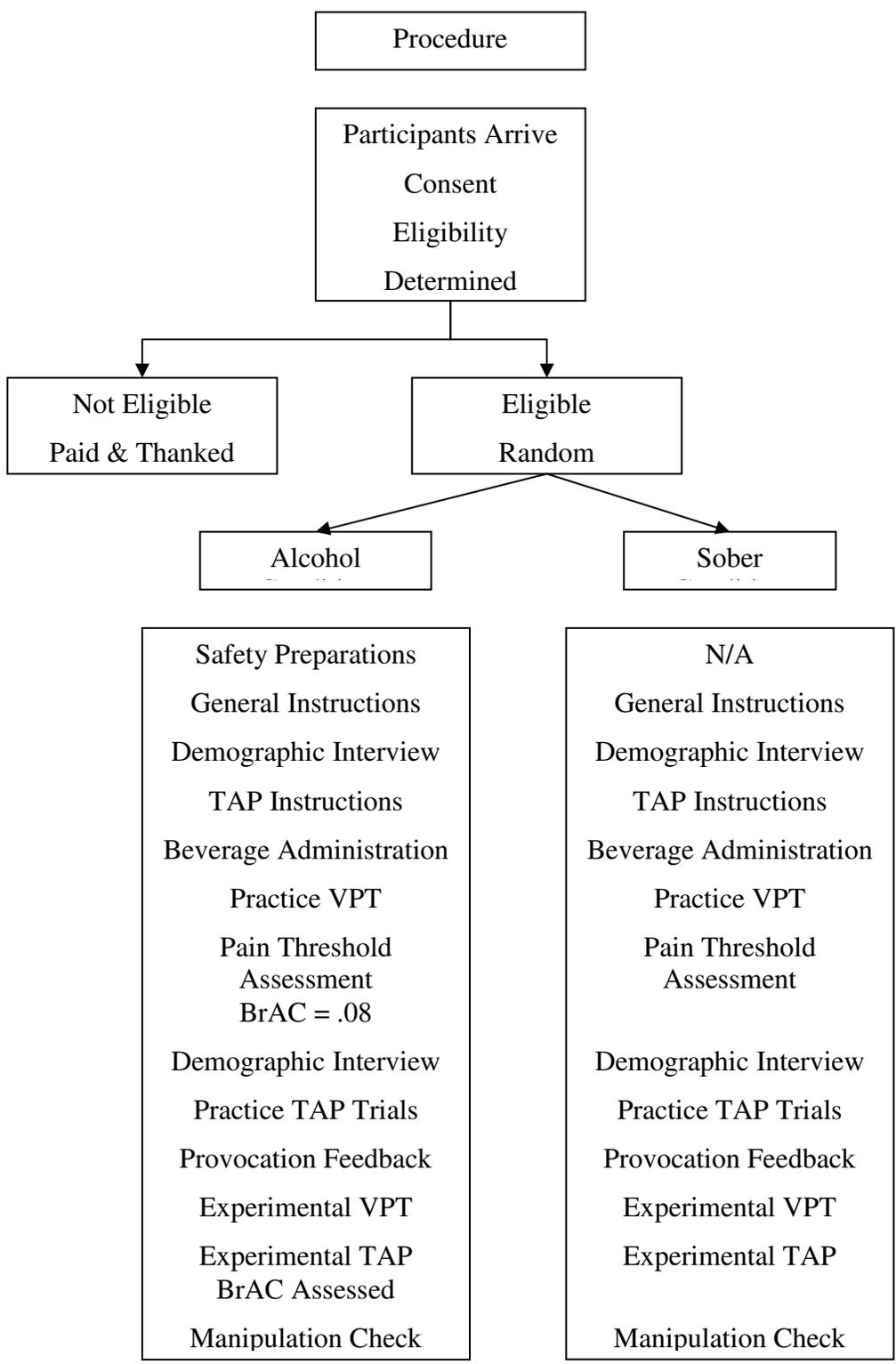


Figure 1. Procedure for the Present Study

RESULTS

Of the 200 participants who were eligible for the experimental portion of the study, 21 did not comply with the experimental protocol (e.g., refused to listen to the experimenter), 10 were not deceived (see deception manipulation below), five did not have data due to a computer or experimenter error, three did not achieve a BrAC of .08, and one became nauseous during the experimental procedure. This left a final sample of 160 men (Age: $M = 25.79$, $SD = 4.29$). The racial composition of this sample consisted of 92 African-Americans, 50 Caucasians, and 18 men who identified with another racial description. Eighty-one percent of participants had never been married, the mean education level was 14 years, and the mean income level was \$26,656 yearly.

Manipulation checks

Deception manipulation. To verify task deception, participants were asked to orally discuss with the experimenter whether or not they thought the VPT and TAP were good measures of reaction time. In addition, participants were asked to orally describe their overall “impression” of their opponent during the tasks and to comment on whether they thought their opponent was “reasonable.” Overall, the deception manipulation appeared successful. Ten participants (five no-alcohol/no-distraction and five alcohol/no-distraction) reported that they did not believe they were competing against another person and were removed from analyses. Participants typically stated that they thought their opponent was “overconfident” or “a jerk” and most stated that they believed the VPT and TAP were good measures of reaction time.

BrAC levels. All participants tested in this study had BrACs of .00% upon entering the laboratory. Individuals in the alcohol group had a mean BrAC of .091% ($SD = .012%$) just before the experimental procedures commenced and a mean BrAC of .113% ($SD = .016%$) immediately following the experimental procedures. Thus, all intoxicated participants were on

the ascending limb of the BAC curve during the experimental procedures. Participants in the no-alcohol control condition had a mean BrAC of .00% before and after the experimental procedures.

Data Preparation

Preliminary analyses. Independent samples t-tests and chi-square analyses did not evidence significant differences in demographic characteristics (i.e., age, years of education, and yearly income), past alcohol use (i.e., frequency and quantity alcohol consumption), and dispositional physical aggression between (a) eligible men who completed the study and noneligible men who did not complete the study, or (b) eligible men who completed the study and eligible men who did not complete the study.

Random group assignment was expected to produce an equal distribution of pertinent demographic and dispositional variables across experimental groups. To confirm this assumption, a series of 2 (Beverage) X 2 (Distraction) between-groups analysis of variances (ANOVAs) were conducted with pertinent demographic characteristics (e.g., age, years of education, yearly income, race, marital status), past alcohol use (i.e., frequency and quantity alcohol consumption), and dispositional physical aggression. No significant group differences emerged for years of education, yearly income, or dispositional physical aggression. However, a significant main effect of distraction was detected for age $F(1,159) = 3.88$, $p = .05$, and a significant interaction was found for frequency of drinking $F(1,159) = 4.43$, $p = .04$ ¹. Chi-square analysis did not detect a significant difference in the racial composition or marital status

¹ There is no theoretical evidence to suggest that age should significantly influence the effects of distraction on alcohol-related attentional biases or physical aggression within our sampled age-range of 21-35 year-old participants. In addition, whereas copious research indicates that history of high quantity alcohol consumption is a strong indicator of aggressive behavior, history of frequent alcohol consumption has not been found to be meaningfully related to aggressive behavior (e.g., Foran & O'Leary, 2008; Parrott & Giancola, 2006). Nonetheless, separate analyses were computed with age and frequency of alcohol consumption as covariates in the first step of the hierarchical regression models. Results did not significantly differ after accounting for these variables.

of the experimental groups. Finally, inspection of the distribution of aggression scores revealed one extreme outlier (i.e., beyond 3 SDs). This case was removed prior to hypothesis testing.

Bias scores. Data from trials with errors were excluded from analysis. Reaction times (RTs) less than 200 ms and greater than three standard deviations above the mean were defined as outliers and were discarded. The mean RT was computed based on probe location (i.e., top probe, bottom probe) and type of word the probe replaced (i.e., aggression, anger, neutral) for each condition (i.e., aggression-neutral, anger-neutral, neutral-neutral) within each subject (see “visual probe task” and Appendix 1, for more detail).

Regression Analyses

Due to the fact that probe location is a repeated-measure variable (bottom probe and top probe), the sum/difference regression method was employed. This technique was chosen because it allows for the examination of interaction terms involving repeated-measures variables (Judd, Kenny, & McClelland, 2001). Without the use of this method, separate models would need to be created for each level of probe location and would not allow for the testing of interaction terms for this variable. As such, two new dependent variables were created. The first variable (DV1) represented the sum of the response times to bottom and top probe locations ($DV1 = \text{Bottom Probe Location} + \text{Top Probe Location}$). The second variable (DV2) represented the difference between the two responses ($DV2 = \text{Bottom Probe Location} - \text{Top Probe Location}$). The regression models (see below) were computed separately with DV1 and DV2 as criterion variables. As such, the coefficients for the DV1 model represented the “between” effects and the coefficients for the DV2 model represented the “within” effects. Given that independent or interactive effects of probe location were not anticipated, regression models that examined within subjects effects (i.e., DV2 as criterion variable) were not expected to be significant.

Prior to computing regression models, dummy coding and effects coding were employed to standardize the categorical variables (i.e., beverage condition, distraction condition). Effects coding was utilized in regression models with interactions comprised of two categorical variables (i.e., Models 1 & 2) and dummy coding was utilized in regression models with interactions comprised of one categorical variable and one continuous variable (i.e., Model 3) (Cohen, Cohen, West, & Aiken, 2003). Furthermore, when bias scores were entered as the predictor variable (i.e., Model 1 and Model 3), they were mean centered by subtracting the mean score of the variable from the raw score of the variable. According to Cohen and colleagues (2003), mean centering first-order continuous variables is advantageous for both statistical and substantive reasons. Most importantly, this procedure reduces multicollinearity between interaction terms and their constituent lower-order terms and improves the interpretability of regression equations. Furthermore, the computation of interactions with raw scores yields incorrect regression coefficients because they are not scale invariant. Interaction terms were calculated by obtaining cross-products of pertinent first-order variables. When using this procedure, it is important to interpret the unstandardized, and not the standardized, regression solution. As such, all parameter estimates for interaction effects are reported as unstandardized *bs*. In contrast, estimates of main effects and simple slopes are reported as standardized β s. Furthermore, significant interaction terms involving two categorical predictors were examined using a series of planned independent samples t-tests to determine whether the groups differed significantly from one another.

The overarching hypothesis of mediated moderation was tested by computing three regression models (Muller et al., 2005). In the first model (Hypothesis 1), the outcome variable (i.e., aggression) was regressed on the predictor (i.e., Beverage Group), the moderator (i.e.,

Distraction Condition), and the Beverage Group X Distraction Condition interaction. In the second model (Hypothesis 2), the mediating variable (i.e., bias) was regressed on the predictor (i.e., Beverage Group), the moderator (i.e., Distraction Condition), and the Beverage Group X Distraction Condition interaction. In the third model (Hypothesis 3), aggression was regressed on the predictor (i.e., Beverage Group), the moderator (i.e., Distraction Condition), the Beverage Group X Distraction Condition interaction, the mediator (i.e., Bias), and the Moderator X Mediator interaction term (i.e., Distraction Condition X Bias interaction). In order to demonstrate mediated moderation, the Beverage Group X Distraction Condition interaction term must be significant (Model 1), the Beverage Group X Distraction Condition interaction term must be significant (Model 2), the effect of bias must be significant (Model 3), and the Beverage Group X Distraction Condition interaction term must be reduced to a non-significant level (Model 3).

Table 3.

Descriptive Statistics and Correlations for Aggression

Bias and Physical Aggression Variables

Variable	Descriptives		
	<i>M</i>	<i>SD</i>	range
Aggression Bias	-2.35	30.57	-165-59
Aggression (z-scored)	0.00	1.57	-4-4

Effects of Distraction on Alcohol-Facilitated Physical Aggression

The model was not significant, $F(3, 155) = 1.72, p = .17, R^2 = .013$. Beverage condition ($\beta = .06, p = .48$) and distraction condition ($\beta = -.10, p = .23$) was not significantly related to physical aggression. However, the Beverage X Distraction interaction was significant ($b = -.223,$

$p = .05$). Examination of this interaction indicated that intoxicated, distracted participants ($M = -.29, SD = 1.47$) were significantly less aggressive than intoxicated, non-distracted participants ($M = .45, SD = 1.74$), $t(75) = 2.01, p = .05$. Significant differences in aggression were not observed between (1) intoxicated, distracted participants ($M = -.29, SD = 1.47$) and sober, distracted participants ($M = -.02, SD = 1.46$), or (2) sober, non-distracted participants ($M = -.17, SD = 1.55$) and sober, distracted participants ($M = -.02, SD = 1.46$). Overall, these findings indicated that alcohol consumption was not independently associated with higher levels of aggressive behavior. However, these findings evidenced that distraction successfully attenuated the effect of alcohol on aggression.

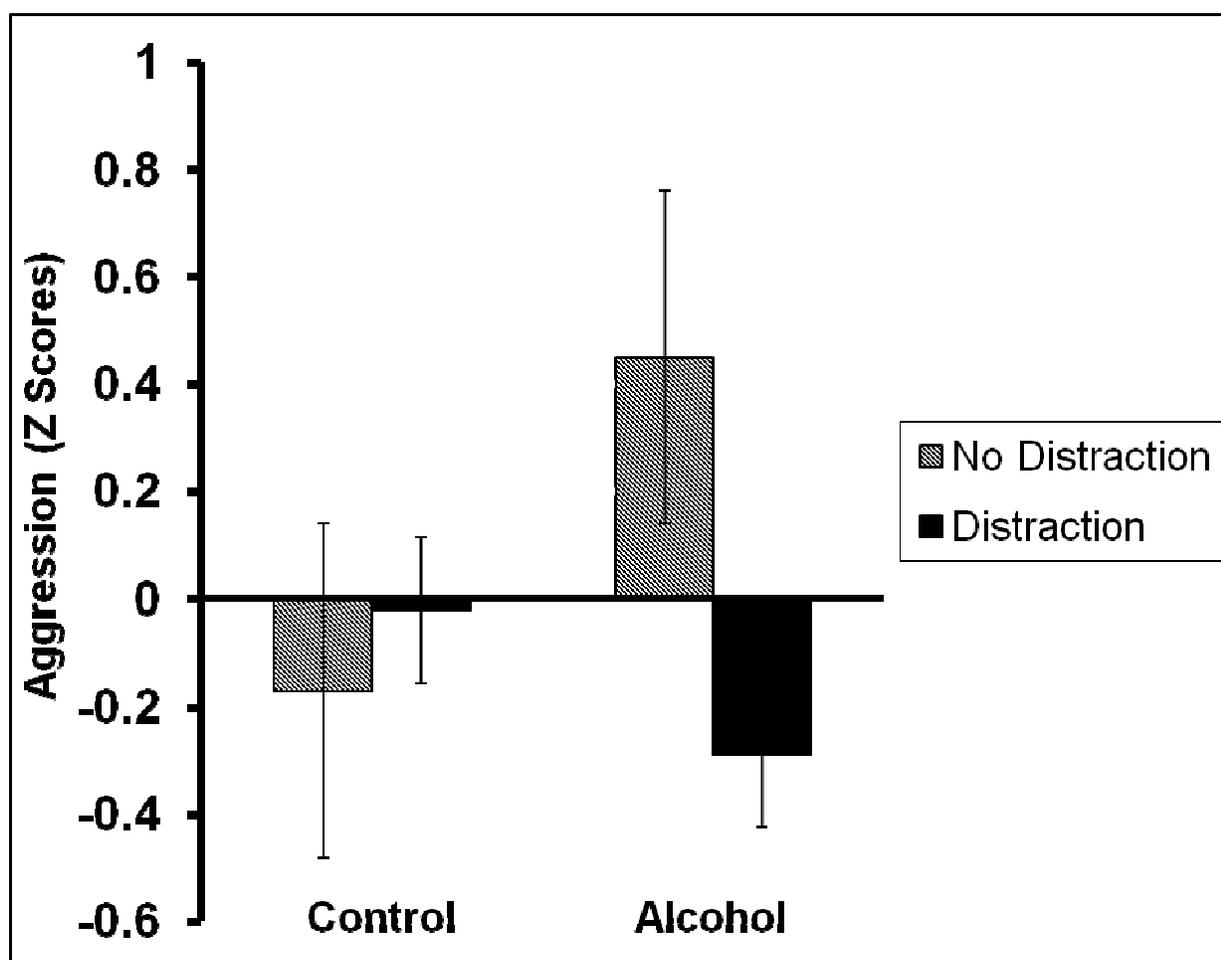


Figure 2. Effect of Distraction on the Relation Between Beverage Consumption and Aggression

Effects of Distraction on Alcohol-Facilitated Attentional Bias

Anger/aggression bias. With the between effects variable (i.e., DV1) as the criterion variable, the model was not significant, $F(3, 155) = .489, p = .691, R^2 = -.01$. The effects of beverage condition ($\beta = .07, p = .382$), distraction condition ($\beta = -.06, p = .440$), and their interaction ($b = -.648, p = .854$) were not significant. This indicated that the independent and interactive effects of alcohol consumption and distraction were not significantly related to attentional bias for anger/aggression words. Because the interaction effect was not significant, analysis of the within effects (DV1) for anger/aggression words are not reported here.

Anger bias. With the between effects variable (i.e., DV1) as the criterion variable, the model was not significant, $F(3, 155) = 2.084, p = .105, R^2 = .039$. The effect of beverage condition ($\beta = .15, p = .06$) was marginally significant. This indicated that alcohol consumption was marginally related to a heightened attentional bias for anger words. Furthermore, distraction condition ($\beta = .02, p = .802$) and the Beverage X Condition interaction were not significant ($b = 11.216, p = .096$). Because the interaction effect was not significant, analysis for the within effects (DV1) for anger words are not reported here.

Aggression bias. With the between effects variable (i.e., DV1) as the criterion variable, the model was significant, $F(3, 155) = 3.506, p = .017, R^2 = .064$. The effects of beverage condition ($\beta = -.107, p = .172$) and distraction condition ($\beta = -.117, p = .136$) were not significant. However, the Beverage X Distraction interaction was significant ($b = -12.51, p = .01$). Examination of this interaction indicated that (1) intoxicated, distracted participants ($M = -15.87, SD = 41.40$) evidenced significantly less attentional bias toward aggression words than intoxicated, non-distracted participants ($M = 3.76, SD = 28.15$), $t(75) = 2.46, p = .02$, (2) intoxicated, distracted participants ($M = -15.87, SD = 41.40$) displayed significantly less

attentional bias toward aggression words than sober, distracted participants ($M = 3.16$, $SD = 25.95$), $t(76) = 2.47$, $p = .02$, and (3) sober, non-distracted participants ($M = -2.23$, $SD = 22.10$) and sober, distracted participants ($M = 3.16$, $SD = 25.95$) did not significantly differ in attentional bias toward aggression words. Overall, these findings indicated that distraction successfully attenuated intoxicated participants' attentional bias toward aggression words.

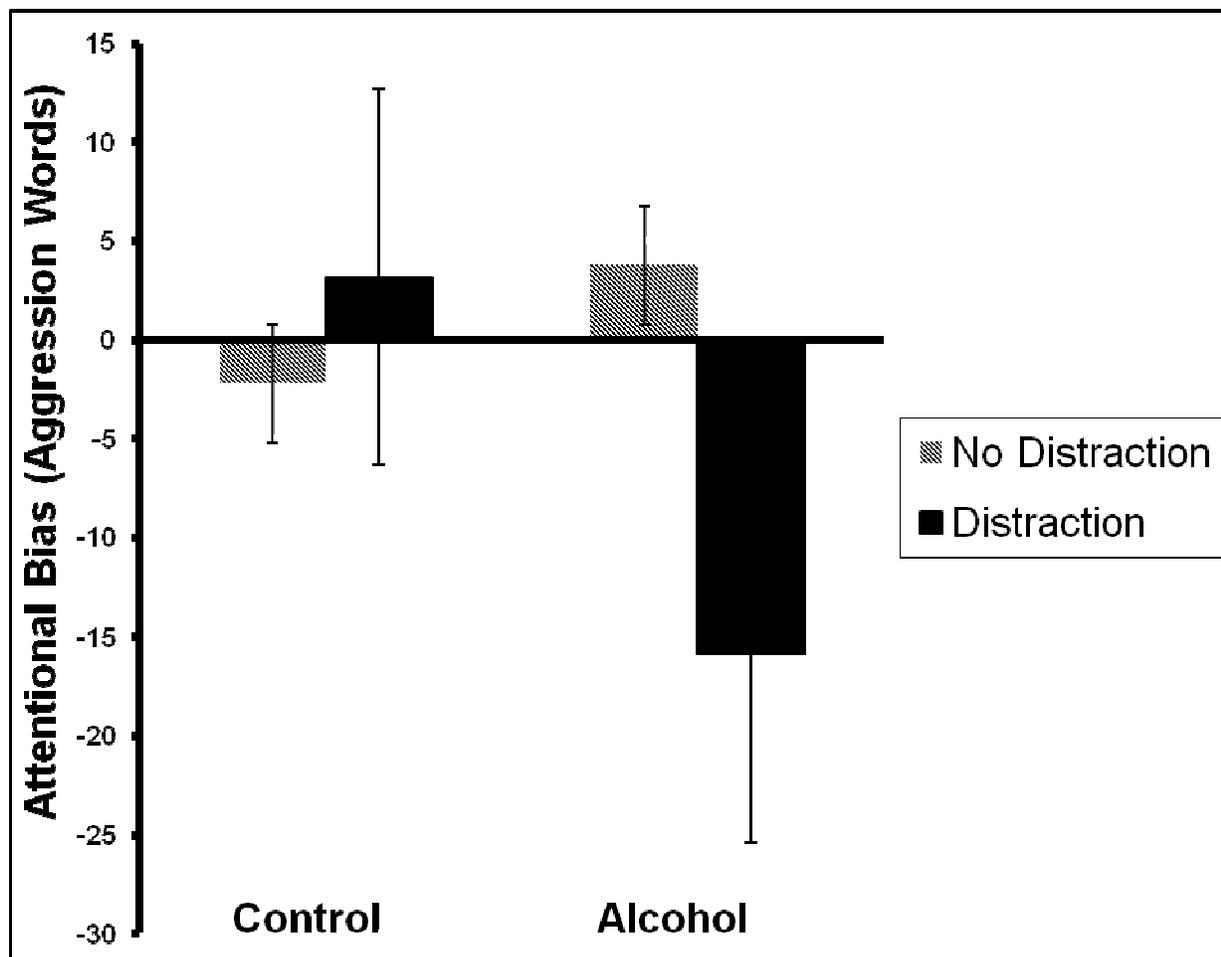


Figure 3. Effect of Distraction on the Relation Between Beverage Consumption and Attentional Bias Toward Aggression-Themed Words

With the within effects variable (i.e., DV2) as the criterion variable, the model was not significant, $F(3, 155) = 2.084$, $p = .105$, $R^2 = .039$. The effects of beverage condition, distraction

condition, and their interaction were not significant. This indicated that probe location did not significantly influence the results.

Effects of Alcohol, Distraction, and Attentional Bias on Physical Aggression

Because prior analyses determined that distraction successfully attenuated intoxicated participants' aggressive behavior and attentional bias toward aggression words, the final criterion for mediated moderation (Muller et al., 2005) was tested with aggression bias as the mediator variable. The model was not significant, $F(2, 156) = .944, p = .39, R^2 = .012$. The effect of aggression bias was not significant (Model 3). Thus, the criteria for mediated moderation were not met.

Reaction Times (RT's) on the TAP

During the TAP, participants' reaction time in releasing the spacebar was recorded for each trial. To the extent that the distraction task consumed limited capacity cognitive resources (and thus attracted attention away from instigatory cues), participants in the distraction condition should evidence slower reaction times than participants in the no-distraction condition. To examine this possibility, a 2 (Beverage) X 2 (Distraction) ANOVA was conducted with RT's during the TAP as the dependent variable. Results evidenced significant main effects for both variables. Specifically, participants in the distraction condition ($M = 287$ ms, $SD = 45$ ms) had significantly slower RT's than those in the no-distraction condition ($M = 257$ ms, $SD = 37$ ms), $F = (1, 158) = 28.34, p < .001$. Likewise, participants in the alcohol condition ($M = 289$ ms, $SD = 44$ ms) had significantly slower RT's than those in the sober condition ($M = 256$ ms, $SD = 36$ ms), $F = (1, 158) = 34.51, p < .001$. Overall, these data suggest that the distraction task demanded limited cognitive resources and disrupted participants' attention allocation. This pattern of findings is consistent with Giancola and Corman (2007).

DISCUSSION

The primary aim of the present investigation was to systematically test the attention-allocation model (AAM) of alcohol myopia theory (AMT; Pernaenen, 1976; Steele & Josephs, 1990; Taylor & Leonard, 1983). Despite the fact that the AAM has received empirical support for other social behaviors of public concern (e.g., risky sex, drunk driving) (MacDonald, Fong, Zanna, & Martineau, 2000; MacDonald, MacDonald, Zanna, & Fong, 2000; MacDonald, Zanna, & Fong, 1995) extant research has yet to examine the behavioral and cognitive underpinnings of this model within the framework of alcohol-facilitated aggression. Accordingly, the goals of the present study were threefold: (1) to test behaviorally the effects of alcohol and distraction on aggression among provoked individuals using a modified version of the Taylor Aggression Paradigm (Giancola & Zeichner, 1995a), (2) to examine the effects of alcohol and distraction on attention to anger/aggression-related stimuli among provoked individuals using a visual probe task (e.g., MacLeod, Soong, Rutherford, & Campbell, 2007; Mogg & Bradley, 1999), and (3) to determine whether differences in attention allocation to anger/aggression-related stimuli on the VPT were associated with concomitant increases in participants' aggression on the TAP.

In accordance with these goals, it was hypothesized that (1) intoxicated men whose attention was distracted would display the lowest levels of aggression relative to intoxicated men whose attention was not distracted or sober men in both distraction groups, (2) intoxicated men whose attention was distracted would display the lowest attentional bias for anger/aggression words relative to intoxicated men whose attention was not distracted or sober men in both distraction groups, and (3) attentional bias toward anger/aggression words on the VPT would predict subsequent aggressive behavior on the TAP for only intoxicated men whose attention was distracted. Taken as a whole, results of the study generally supported the hypotheses. The

overall findings indicated that (1) intoxicated men whose attention was distracted enacted less physical aggression than intoxicated men whose attention was not distracted, (2) intoxicated men whose attention was distracted displayed the lowest attentional bias toward aggression words (but not anger words or anger/aggression words) relative to intoxicated men whose attention was not distracted or sober men, and (3) attentional bias toward aggression words did not account for the relation between alcohol intoxication and aggression, regardless of experimental condition.

Foremost, this study provides the first known cognitive data to support the attentional processes posited by the AAM and replicates and extends past behavioral findings (Giancola & Corman, 2007) for this model as an explanation for intoxicated aggression. According to the AAM, the pharmacological properties of alcohol impair executive cognitive functioning by (1) narrowing attentional focus, (2) restricting the range of cues that can be processed, and (3) reducing capacity to process and generate meaning from cues that are processed. Because in most real-world situations cues that instigate behavior are more salient and easier to process than cues that inhibit behavior, intoxication is likely to produce myopia toward cues that instigate behavior (e.g., provocation) to the exclusion of cues that inhibit behavior (e.g., negative consequences of aggression). Though it may seem inevitable that this myopia will engender aggression, the first goal of the present study was to replicate and extend past findings that suggest alcohol intoxication can function to *both* increase and decrease aggression when attention allocation is manipulated (Giancola & Corman, 2007).

Effects of Distraction on Alcohol-Facilitated Physical Aggression

In line with past findings (Giancola & Corman, 2007), results indicated that intoxicated men whose attention was distracted during the TAP evidenced less aggression than intoxicated men whose attention was not distracted during the TAP. In addition, as hypothesized by the

AAM, this aggression was reduced below that of sober participants, but not to a significant extent. In other words, these data suggest that during a hostile situation, alcohol intoxication can *decrease* aggression below that of sober men when attention is distracted away from salient cues of instigation (i.e., threat from an opponent). Additionally, this pattern of results was obtained with an extreme-provoked sample of men. Though Giancola & Corman (2007) utilized high physical provocation, the present study incorporated both high verbal and high physical provocation. As such, our data suggest that cognitive distraction attenuates intoxicated aggression in extreme-provoked men.

Furthermore, among men whose attention was not distracted, alcohol intoxication increased aggression above that of sober men, but not to a significant extent. Though unexpected, this finding is in line with past research that has identified provocation to be one of the strongest elicitors of aggressive action (Anderson & Bushman, 2002; Bettencourt & Miller, 1996; Geen, 2001). In fact, studies indicate that aggression increases as level of provocation increases (Giancola et al., 2002; Lau & Pihl, 1994; Taylor & Gammon, 1975). Indeed, all participants in this study, regardless of experimental condition, encountered a hostile situation in which their opponent provoked them both verbally (i.e., practice TAP feedback) and physically (i.e., practice TAP shocks) prior to the experimental TAP trials. In addition, whereas in traditional TAP studies participants typically face a number of “unprovoked” aggression trials (i.e., shock intensities of 1’s and 2’s) from their opponent prior to “provoked” aggression trials (i.e., shock intensities of 9’s and 10’s), the present study only utilized “provoked” aggression trials. Indeed, this modification was necessary to the present study in order to experimentally prime participants’ attention allocation for the VPT. Thus, given the extreme provocation of all

participants, the fact that sober men's aggression was not significantly lower than intoxicated, non-distracted men's aggression is not unreasonable.

Effects of Distraction on Alcohol-Facilitated Attentional Bias

While it was important to replicate Giancola and Corman's (2007) findings and extend these results to a sample of highly provoked men, the next step in this line of research was to test the cognitive underpinnings of the AAM in relation to intoxicated aggression. Indeed, investigations based solely on behavior are not direct tests of whether intoxicated participants' attention is actually focused on salient cues that presumably instigate aggression (i.e., anger/aggression stimuli) or whether aggression is decreased by the disruption of working memory (i.e., cognitive distraction). As such, the second goal of the present study was to examine the effect of cognitive distraction on sober and intoxicated men's attention allocation toward anger and aggression words using a VPT (reviewed in MacLeod, Soong, Rutherford, & Campbell, 2007; Mogg & Bradley, 1999). In accordance with predictions, results evidenced that intoxicated men whose attention was distracted during the VPT evidenced the lowest attentional bias toward aggression words as compared to non-distracted intoxicated men and sober men.

However, counter to predictions, this pattern of findings did not emerge for anger words or for the combination of anger and aggression words. This suggests that, among our sample of provoked men, attention toward behavioral stimuli may have been more salient than attention toward emotional stimuli. This result may be explained, at least in part, by the operational meanings of the words. Whereas aggression words were defined as "a *behavioral process* that includes the goal of inflicting harm to another living being (i.e., not to an inanimate object) who is motivated to avoid the act", anger words were defined as "an *emotional state* that can vary in intensity, from mild annoyance to rage. The experience of anger lacks a specific goal" (Parrott

& Giancola, 2007). Given the provoked status of participants, one would expect them to be quite angered. Thus, it may come as a surprise that participants' attention was not allocated toward anger words to a significant degree. However, this finding may be reconciled by the nature of the provocation participants received. In addition to physical provocation from the high intensity shocks, participants were given verbal feedback from their opponent that physically threatened them with high shocks during a later portion (i.e., experimental TAP trials) of the study. In fact, participants not only received the message that their opponent intended to shock them with all 10's but also heard their opponent state that he felt excitement with the opportunity to harm him. Thus, one plausible account for this finding may be that participants' attention was more focused on thoughts of retaliation (i.e., a behavioral process) than on thoughts of anger (i.e., an emotional state). Alternatively, this pattern of findings may indicate that the anger words elicited a negative valence effect in participants, causing an avoidance reaction when processing these words. Nevertheless, before definitive conclusions may be reached, future research is needed to further elucidate these results.

Effects of Alcohol, Distraction, and Attentional Bias on Physical Aggression

The first two aims of the present study advanced scientific understanding of the cognitive and behavioral effects of acute alcohol intoxication on aggression. Nonetheless, it remained unclear whether attention allocation toward aggression stimuli would correspond directly to aggressive behavior. Counter to expectations, results of the study did not support the hypothesis that attentional bias toward aggression stimuli accounts for subsequent aggressive behavior. Several explanations for this outcome can be advanced. First, the present study only measured attention allocation to semantic stimuli (i.e., the VPT words); attention allocation to actual instigatory or inhibitory cues in the environment (e.g., opponent threat to administer high shock

levels, an anti-violence sign, respectively) was not measured. As a consequence, the semantic stimuli participants' attended to was likely one step removed from the actual environmental cues purported to mediate intoxicated aggression. Of course, it is not clear from these data if attention allocation toward anger or aggression stimuli is the mechanism for intoxicated aggression. Future research would benefit from testing attention allocation to real-world stimuli in a naturalistic setting (e.g., a bar).

Second, it is possible that the aggression words measured during the VPT did not specifically capture men's "cognitive experiences" during the TAP. Future research may benefit from utilizing assessment measures that are better able to capture the intervening cognitive mechanisms for this aggression. In fact, cognitive-behavioral theory and research suggests a strong correlation between affect and thought which is said to comprise an overall state of cognition (Wright, Basco, & Thase, 2006). As such, one potential avenue for this investigation would be to employ real-time measures of state affect (e.g., facial coding) and cognition (e.g., articulated thoughts paradigm). Indeed, past research has successfully utilized facial coding (e.g., Parrott, Zeichner, & Stephens, 2003) and the articulated thoughts paradigm (e.g., Davison, Vogel, & Coffman, 1997; Eckhardt, Barbour, & Davison, 1998) to examine alcohol-related affect in the laboratory. Indeed, these methodologies provide a more valid and less obtrusive assessment that can more readily map onto participants' behavior.

Thirdly, it is plausible that other non-attentional processes account for the proposed relation. If this is indeed the case, it is possible that analysis of our single mediator (i.e., attention allocation toward semantic stimuli) failed to detect an effect due to lack of power (MacKinnon, 2008). Indeed, the constructs under investigation are multifaceted and, as such, may be better explained with a multiple mediator model. For example, extant research

implicates hegemonic beliefs about the male gender role (Gallagher & Parrott, in press; Thompson & Pleck, 1986), and the stress this may produce (Copenhaver, Lash, & Eisler, 2000; Eisler & Skidmore, 1987), as risk factors for aggression in men. Thus, in addition to measuring the “in the moment” affective states and cognitions of participants, future studies may benefit from assessing measures of gender role beliefs and state gender role stress, especially under hostile situations where participants are provoked. Assessing multiple constructs will allow researchers to produce models that may be more appropriately equipped to assess the intervening mechanisms for intoxicated aggression. Indeed, as Morris Rosenberg (1968) stated “in the absence of a concern for such mediating or intervening mechanisms, one ends up with facts, but with incomplete understanding” (p. 63).

Inhibition Conflict

Although the present investigation did not specifically test the inhibition conflict model (ICM) of AMT, results of the study provide preliminary support for this model for alcohol-facilitated aggression. According to the ICM, aggression is most likely to occur during high conflict situations where salient instigatory and salient inhibitory cues are simultaneously presented. Under high conflict conditions, the AAM states that alcohol intoxication will focus attention onto whatever set of cues are most salient and easiest to process; in typical real-world situations, these cues tend to be instigatory. However, this model also postulates that sober individuals who face salient cues of opposition are less susceptible to these attentional processes because they presumably possess more cognitive flexibility to attend to both sets of cues. Indeed, the present study placed all participants in a high conflict situation in which they presumably faced salient instigatory (e.g., provocation) and salient inhibitory (e.g., threat of retaliation) cues from their opponent. Thus, consistent with the ICM, data suggested that sober

participants' attention allocation and aggression was less affected by cognitive distraction, relative to intoxicated participants. Furthermore, although sober participants displayed less aggression bias and physical aggression than intoxicated, non-distraction participants, this difference was not significant. As such, in accordance with the ICM, even sober participants in a high conflict situation evidenced similar, albeit slightly less, aggression bias on the VPT and physical aggression on the TAP, as compared to intoxicated non-distracted participants.

Limitations

Several limitations of the present study merit discussion. First, we did not assess participants' cognitions during the TAP. As mentioned previously, future research would benefit from employing alternative techniques (e.g., facial coding, articulated thoughts paradigm) to capture participants' affective states and cognitions at the same time as the behavior. Second, the questionnaire battery that assessed dispositional aggression was administered directly before the experimental procedures. As such, this may have primed participants' thoughts about aggression and unknowingly engendered alcohol-aggression expectancies. However, given the mixed findings for the expectancy-aggression relationship (e.g., Giancola, Godlaski, & Parrott, 2006; Giancola & Zeichner, 1997) and the manipulation checks utilized prior to debriefing, effects of this limitation are most likely negligible. Nevertheless, future research may be strengthened by separating the questionnaire battery and experimental procedures into different sessions.

Finally, although the distraction task was successful in decreasing intoxicated men's attentional bias toward aggression stimuli and physical aggression in the laboratory, the ecological validity of this task is limited and cannot be specifically applied to interventions to reduce this aggression. However, this limitation is tempered by the strength of the internal

validity of the study as well as considerations of the fact that it is the theoretical mechanism, and not the specific intervention, that may be generalized to naturalistic settings. Put another way, the intention of this study was not to predict whether intoxicated men would aggress (or not aggress) in the “real world.” Rather, this study sought to systematically test the theoretical assumptions of the AAM. Indeed, it has been argued that external validity is not the same thing as generalizability (Mook, 1983). As Mook (1983) wrote “The distinction between generality of findings and generality of theoretical conclusions underscores what seems to me the most important source of confusion in all this, which is the assumption that the purpose of collecting data in the laboratory is to predict real-life behavior in the real world” (p. 381). Indeed, Anderson and Bushman (1997) astutely noted that “the primary goal of most laboratory research is the development of theories designed to explain underlying processes and mechanisms..., it is these theoretical principles that one wishes to generalize, not the specific characteristics of the sample, setting, manipulation, or measure” (p. 22). Nonetheless, future work should begin to develop interventions (e.g., mindfulness techniques) with “real world” implications for intoxicated aggression.

Clinical Implications

The present investigation offers theoretically-based data that support intervention efforts for alcohol-facilitated aggression. Recently, Giancola, Josephs, DeWall, and Gunn (2009) proposed preventative strategies for alcohol-facilitated aggression based upon the AAM (Pernanen, 1976; Steele & Josephs, 1990; Taylor & Leonard, 1983). In accordance with this model, researchers highlighted the counterintuitive finding that alcohol intoxication can *decrease* aggressive behavior (Giancola & Corman, 2007). As previously discussed, the present study replicated this finding and further found that attention can be shifted away from aggression-

promoting cues in intoxicated individuals. In accordance with recommendations put forth by Giancola and Colleagues (2009), results of this study implicate the need for techniques that increase both dispositional salience of inhibitory cues (e.g., increased mindfulness) and situational salience of inhibitory cues (e.g., billboards that proscribe drunken fighting). The presence of such cues, especially in settings where alcohol-facilitated aggression is more likely to occur (e.g., bars), could be integral in the reduction of alcohol-related violence. Additionally, recent data suggest that dispositional mindfulness (i.e., awareness of the present moment) may serve as a protective factor against aggressive behavior (Gallagher, Hudepohl, & Parrott, under review; Heppner et al., 2008; Singh, Wahler, Adkins, & Myers, 2003; Singh et al., 2007). In fact, in accordance with the AAM, Gallagher, Hudepohl, & Parrott (under review) found that a history of heavy episodic drinking was associated with more frequent sexual aggression among men who reported low, but not high, levels of dispositional mindfulness. Thus, interventions designed to increase mindfulness may serve to decrease aggression in intoxicated individuals by affording these individuals more cognitive flexibility. Thus, in high conflict situations, these individuals would be better able to shift attention back to inhibitory cues (e.g., social norms that proscribe aggression) and thus minimize their likelihood of aggression (Gallagher et al., under review; Giancola et al., in press).

Future research should focus on the development of ecologically valid interventions (e.g., increasing mindfulness in high-risk men) for intoxicated aggression. Such work could employ a laboratory-based mindfulness intervention with a population of intoxicated men who have perpetrated recent aggression. If findings from this work continue to support the theoretical tenants of the AAM, treatment-outcome studies could then be utilized to further refine interventions for the reduction of intoxicated aggression.

Concluding Summary

So, if a person is distracted when he is drunk, will he be less aggressive? Results of this study say “yes,” cognitive distraction (i.e., disruption of working memory) can reduce intoxicated, provoked men’s physical aggression and attention allocation toward aggression stimuli below that of sober men. However, results did not indicate that attention allocation toward aggression stimuli accounted for the relation between alcohol intoxication and aggression. Nonetheless, this study provides the first known cognitive data to support the attentional processes posited by the AAM and replicates and extends past behavioral findings (Giancola & Corman, 2007) for this model as an explanation for intoxicated aggression. As future research elucidates mechanisms for intoxicated aggression, interventions for reducing this aggression will be able to be employed.

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APPENDIX A
CONDITIONS FOR VISUAL PROBE TASK

Condition #	Probe Location	Type of Pair	Probe Replaces What Type of Word	Frequency Count
1	Top	Anger-Neutral	Anger	6
2	Top	Anger-Neutral	Neutral	6
3	Top	Aggressive-Neutral	Aggressive	13
4	Top	Aggressive-Neutral	Neutral	13
5	Bottom	Anger-Neutral	Anger	6
6	Bottom	Anger-Neutral	Neutral	6
7	Bottom	Aggressive-Neutral	Aggressive	13
8	Bottom	Aggressive-Neutral	Neutral	13
9	Top	Neutral-Neutral	Neutral	20
10	Bottom	Neutral-Neutral	Neutral	20

APPENDIX B
STIMULUS WORD PAIRINGS

Anger/Aggression Words – Neutral Words		Neutral Words – Neutral Words	Practice Words
Abuse/alike ₂	Maddened/midair ₁	Album/acorns	Address/ articles
Anger/absence ₁	Malice/message ₁	Apple/appoint	Bench/because
Angry/amounts ₁	Massacre/mackerel ₂	Backpack/balding	Regular/reply
Annihilate/accordion ₂	Menace/marrow ₂	Boar/board	Plaza/peak
Argue/actor ₂	Mutilate/maverick ₂	Bonnet/borough	Novels/night
Assault/assert ₂	Offend/olive ₁	Bread/brush	Material/minerals
Attack/account ₂	Outrage/outputs ₁	Canyon/carpet	Lasting/lottery
Batter/banjo ₂	Outraged/outdoors ₁	Cascade/cashmere	Inflection/influx
Bloody/brazil ₂	Pissed-off/paleness ₁	Crayons/coupon	Seedless/sections
Break/bank ₂	Punch/paved ₂	Cubic/corn	Tractors/thursday
Brutal/bucket ₂	Punish/picnics ₂	Dog/drew	
Burn/bush ₂	Quarrel/quoted ₂	Dozen/driver	
Capture/classroom ₂	Rage/reads ₁	Drawbridge/drizzly	
Cruel/cone ₂	Rages/rafter ₁	Engineer/enormous	
Crush/chrome ₂	Rape/raft ₂	Enterprise/exercise	
Crushed/danced ₂	Rifle/rising ₂	Farmer/fiber	
Cut/cent ₂	Riot/rabbit ₂	Flower/fusion	
Damage/decades ₂	Ripped/ramp ₂	Foot/formed	
Deceit/decre ₁	Scorn/scouts ₁	Fork/fox	
Despise/directs ₁	Scratch/shelf ₂	Garage/garden	
Destroy/decide ₂	Scream/stove ₂	Ginger/gargle	
Enraged/exits ₁	Shoot/scope ₂	Globe/glove	
Fed-up/footwear ₁	Slash/sage ₂	Holder/honey	
Fight/film ₂	Slaughter/sculpture ₂	Lamp/lawn	
Furious/formulate ₁	Smash/scan ₂	Monkey/meter	
Fury/foil ₁	Stab/sash ₂	Movies/museum	
Gouge/geese ₂	Strike/sake ₂	Newspaper/newton	
Hate/host ₁	Temper/tilted ₁	Noontime/neptune	
Hatred/hired ₁	Threaten/timing ₂	Package/parade	
Horror/hotels ₂	Torture/tablet ₂	Pigeon/pillows	
Hostile/hidden ₁	Upset/unlocked ₁	Pint/pearl	
Humiliate/hyperbole ₂	Violent/vehicle ₂	Raison/ravine	
Hurt/height ₂	Wound/wood ₂	Rental/rounded	
Injure/import ₂	Yell/yarn ₁	Salad/sectors	
Insult/inform ₂		Sandals/shingles	
Intimidate/informative ₂		Skyscraper/slow-moving	
Irritate/intercede ₁		Speaker/spending	
Kick/kent ₂		Teaspoon/textbook	
Knife/key ₂		Texture/theorem	
Mad/mixed ₁		Tulip/tailor	

Note. Anger and aggression word pairings are indicated as follows: Anger = 1; Aggression = 2.