EFFECTS OF ALCOHOL PRIMES ON JUDGMENTS RELATED TO DRINKING AND DRIVING

A Thesis

Presented to

The Faculty of the Graduate School

At the University of Missouri

In Partial Fulfillment

Of the Requirements for the Degree

Master of Arts in Clinical Psychology

By

MARIA E. NICULETE

Dr. Denis M. McCarthy, Thesis Supervisor

MAY 2011

The undersigned, appointed by the dean of the Graduate School,

have examined the thesis entitled

EFFECTS OF ALCOHOL PRIMES ON JUDGMENTS RELATED TO DRINKING AND DRIVING

Presented by Maria E. Niculete

A candidate for the degree of

Master of Arts in Clinical Psychology

And hereby certify that, in their opinion, it is worthy of acceptance.

Denis M. McCarthy, Ph.D.

M. Lynne Cooper, Ph.D.

Matthew P. Martens, Ph.D.

ACKNOWLEDGEMENTS

I would like to thank my advisor, Denis McCarthy, for his support of this project. I would also like to thank my thesis committee members, Lynne Cooper and Matt Martens, for their helpful feedback. Finally, I would like to thank my labmates for their help and advice throughout this process.

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ABSTRACT

Although past research has tested the effects of alcohol related priming on behavior and judgments, previous studies have not investigated the effects of alcohol primes on judgments specific to drinking and driving. Based on the spreading activation model, we hypothesized that participants primed with alcohol words will make drinking and driving judgments consistent with their pre-existing attitudes about engaging in the behavior. Participants (N = 302) were randomly assigned to a priming condition (alcohol, safety, danger or neutral words) and they completed a lexical decision task which served as the priming mechanism. Following the primes, participants were asked to make hypothetical drinking and driving judgments. We found a significant interaction (condition X attitudes) on judgments regarding perceived danger of drinking and driving ($\beta = .43$, $p < .01$). Probing this interaction indicated that the standardized simple slope was .15 ($p = .32$) for participants in the alcohol condition and .70 ($p < .001$) for participants in the neutral condition. Contrary to our hypothesis, these results suggest that pre-existing attitudes were predictive of drinking and driving judgments following the neutral primes but not following alcohol primes. Results from this study may better fit a dual process model of alcohol cognitions, which suggests that behaviors are influenced by both implicit and explicit cognitions. These effects are stronger for participants who report past drinking and driving behavior suggesting that the alcohol primes may activate implicit cognitions about drinking and driving, which are specifically salient for participants who engage in the behavior.

INTRODUCTION

Despite reductions in drinking and driving since the 1980s, the National Highway Transportation Safety Administration (NHTSA) estimated that roughly 40% of all traffic fatalities are alcohol related (NHTSA, 2006). Compared to older drivers, young adults report the greatest prevalence of driving while intoxicated (Chou et al., 2006; Hingson & Winter, 2003). Over one third of college student drivers report driving after dinking in the past month (Wechsler, Lee, Nelson, & Lee, 2003).

Moderate doses of alcohol have been found to impair performance on various laboratory tasks, such as reaction time, which are important to driving performance (Brumback, Cao, & King, 2007; Holloway, 1995; Fillmore, 2003). Numerous studies have tested impairment in driving related skills associated with alcohol intoxication via driving simulators (Harrison & Fillmore, 2005; Harrison, Marczinski, & Fillmore, 2007; Marczinski, Harrison, Fillmore, 2008; Rakauskas et al., 2008; Rupp, Acebo, Seifer, & Carskadon, 2007). Although studies have identified risk factors for drinking and driving, there are few experimental studies intended to explore processes that underlie drinking and driving decisions. The current study tested the effects of contextual primes (e.g., alcohol, danger) on perceptions and decisions regarding drinking and driving.

Perceived Intoxication and Perceived Danger

In a natural drinking situation, people often rely on their perceived intoxication when making judgments about their ability to drive after drinking. However, they are often inaccurate in estimating their level of intoxication (MacDonald, Zanna, & Fong, 1995). Though overestimation tends to be the most common error (MacDonald et al., 1995), people tend to underestimate their perceived level of intoxication as the number of

drinks consumed or the length of time they have been drinking increases (Turrisi & Jaccard, 1991). There are also individual differences in people's perception of intoxication. Compared to light drinkers, heavy drinkers are more likely to anticipate lower levels of intoxication before drinking as well as underestimate intoxication levels after consuming alcohol (Gabrielli, Nagoshi, Rhea, & Wilson 1991). Binge drinkers also report lower perceived impairment, but do not differ in actual impairment on psychomotor performance tasks, when compared to light drinkers (Brumback et al., 2007). This suggests that those who binge drink are less aware of the physical impairments associated with alcohol consumption at high levels (Brumback et al., 2007; Marczinski et al., 2008).

Even when individuals are aware of the extent of their intoxication, they might still drink and drive (Lewis, Merz, Hays, & Nicholas, 1995; Turrisi & Jaccard, 1991). Lewis and colleagues (1995) interviewed participants with prior DUI arrests and found that nearly half of these participants drove, and subsequently were arrested for a DUI, even though they knew that they were above the legal limit to drive. The fact that individuals still choose to drive despite knowing that they are above the legal limit to do so indicates that additional variables impact one's decision to drink and drive.

One variable that might impact one's decision to drink and drive is perceived risk associated with drinking and driving. Young adults are more likely to drink and drive if they perceive the behavior as less dangerous or if their friends are less disapproving of drinking and driving (Grube & Voas, 1996). Young adults who perceive drinking and driving as less dangerous also hold more positive expectancies related to drinking and driving (McCarthy, Pedersen, Thompsen, & Luety, 2006).

Research has shown that perceived risk mediates the association between perceived intoxication and drinking and driving (Gustin & Simons, 2008; MacDonald et al., 1995). People who perceive their level of intoxication as lower also believe that the risk associated with drinking and driving is lower and this increases their likelihood of engaging in this behavior. In an alcohol administration laboratory study conducted by Beirness (1987), individuals who underestimated their perceived level of intoxication were more likely to be heavier drinkers and were more likely to judge themselves fit to drive when their blood alcohol concentration (BAC) was above the legal limit (.08%). Additionally, people who drink and drive were more likely to believe that they were safe to drive after drinking higher amounts when compared to people who do not drink and drive (Royal, 2003).

Research on alcohol outcome expectancies has shown a reciprocal relationship between drinking behavior and positive alcohol expectancies, such that expectancies influence drinking behavior, and drinking behavior in turn influences expectancy endorsement (Smith, Goldman, Greenbaum, & Christiansen, 1995). It is unclear if a similar process operates in the development of drinking and driving cognitions and behaviors. Research has shown that personal experience (i.e., engagement in drinking and driving behavior) can influence cognitions about drinking and driving, such that individuals who were not punished for drinking and driving believe that drinking and driving sanctions are less likely to occur (Piquero & Paternoster, 1998). Additionally, despite the fact that young adults who engage in drinking and driving see this behavior as more dangerous over time, they also perceive their peers as more accepting of this behavior over time (McCarthy & Pedersen, 2009). While the direction of the relationship

between perceived risk of drinking and driving and engagement in the behavior is unclear, perceived risk is an important factor in the drinking and driving decision making process. Experimental studies can play an important role in examining the relationship between perceived risk and engagement in drinking and driving.

Alcohol Related Priming

Priming research has consistently shown that previously seen information can alter a person's behavior (Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trotschel, 2001; Bargh, Chen, & Burrow, 1996; Carver, Ganellen, Froming, & Chambers, 1983) as well as their judgments about others (Carver et al., 1983; Higgins, Rholes, & Jones, 1977) and their environment (Chambon, 2009). For example, individuals primed with words related to elderly people (e.g., wrinkle, Florida, retired) walked slower when leaving the laboratory (Bargh et al., 1996) and perceived hills as steeper and distances as longer (Chambon, 2009) when compared to individuals primed with neutral words. Likewise, participants primed with hostility-related stimuli not only acted more hostile, but also judged other's ambiguous behavior as hostile (Carver et al., 1983).

Research has shown that primes about alcohol and alcohol outcome influence behavior (Friedman, McCarthy, Bartholow, & Hicks, 2007; Friedman, McCarthy, Pedersen, & Hicks, 2009; Goldman, Drakes, & Del Boca, 1999; Roehrich & Goldman, 1995; Stein, Goldman, & Del Boca, 2000) and judgments (Friedman, McCarthy, Forster, & Denzler, 2005) in a way that is consistent with their expectancies about alcohol. For example, individuals primed with suboptimal alcohol word primes rated photographs of women as more attractive if they had the expectation that alcohol increases sexual desire (Friedman et al., 2005). Additionally, individuals primed with alcohol words acted more

hostile towards the experimenter after a provocation if they held the expectancy that alcohol increases aggression (Friedman et al., 2007). Alcohol priming also influences alcohol consumption, such that individuals primed with a video of a drinking context consumed more alcohol when given the chance (Roehrich & Goldman, 1995). Similarly, individuals primed with alcohol outcome primes (e.g., sociability) consumed more alcohol compared to participants primed with neutral words, but only if these participants endorsed alcohol expectancies related to sociability (Friedman et al., 2009). Thus, priming participants with words related to a desirable outcome from consuming alcohol, such as sociability, activates this expectancy and increases drinking behavior (Friedman et al., 2009; Roehrich & Goldman, 1995; Stein et al., 2000).

Priming Effects on Drinking and Driving Decisions

Given the effects of alcohol related priming on behavior and judgments, the current study tested the effects of alcohol primes on judgments related to drinking and driving. We tested the effect of alcohol word primes on perceptions of intoxication and perceptions of risk associated with drinking and driving in hypothetical drinking scenarios. We hypothesized a main effect of alcohol primes on perceptions of intoxication and perceived danger. Individuals primed with alcohol words were hypothesized to judge their expected intoxication and perceived danger from drinking and driving as lower compared to those primed with neutral words. We also hypothesized an interaction between the prime condition and attitudes about drinking and driving. Specifically, when primed with alcohol words, individuals with more positive attitudes toward drinking and driving should perceive their level of intoxication and the danger associated with drinking and driving as lower compared to participants primed with

neutral words. Additionally, we tested whether the responses of the alcohol prime group to questions regarding perceived danger from drinking and driving was more predictive of their drinking and driving behavior at follow up when compared to the neutral prime group.

Based on a spreading activation model, (Collins & Loftus, 1975) priming individuals with specific content increases the accessibility of constructs related to that content. For example, priming individuals with safety words increases the accessibility of constructs related to safety, and can, therefore, make them feel safe. An exploratory component of this project was to test the effects of non-alcohol related priming (i.e., safety and danger word primes) on perceptions of intoxication and risk. Additionally, we were also interested in testing the effects of these primes on people's report of engagement in protective behavioral strategies when consuming alcohol. For example, by activating the construct of safety, participants might report higher engagement in protective behavioral strategies when drinking alcohol because those instances when they are being safe are more readily available. To test these exploratory components, we included priming conditions of safety and danger related words, and tested the effect of these primes on perceptions about drinking and driving and their self-reported engagement in protective behavioral strategies when consuming alcohol. While we did not have specific hypotheses for the effects of these primes, we were interested in exploring whether self-reported behaviors are influenced by suboptimal primes.

METHOD

Participants

Participants (N = 302) were undergraduate students recruited from introductory psychology classes at the University of Missouri. They received course credit for participating in the study. The sample was predominantly female (63.6%) and ranged in age from 18-30 (M = 18.5). The sample was 79.1% Caucasian, 11.3% African American, 2.6% Asian, and 5.1% other racial backgrounds. Additionally, 4.6% of our sample identified their ethnicity as Hispanic. Participants were equally distributed among experimental groups. Ninety-one percent of our sample completed the four week follow-up.

Measures

Demographic Information. Age, gender, ethnicity, year in school, socio-economic status, and residential status (e.g., apartment, Greek house, university dormitory) was assessed. Participants also reported if they have access to a car and if they drive at least once a month.

Drinking Styles Questionnaire (DSQ). The DSQ (Smith, McCarthy, & Goldman, 1995) is a 25-item measure that assesses drinking status, quantity and frequency of drinking, problems experienced while drinking (e.g. nausea, vomiting, blackouts) and typical drinking situations. Internal consistency reliabilities range from .92 (year 1) to .94 (year 3) for the Drink/Drunkenness scale.

Drinking and Driving Attitudes, Behaviors and Normative Beliefs. Participants were asked to report how dangerous they perceive drinking and driving to be, as well as normative beliefs and perceived consequences of drinking and driving. Participants were

asked to rate on a scale of 1 (not at all dangerous) to 4 (very dangerous) how dangerous they think it is to drive after having 1, 3, or 5 drinks in 2 hours. They were also asked to report how many of their three closest friends disapprove of drinking and driving and refuse to ride with a friend who was drinking and driving. Additionally, participants were asked to estimate the likelihood of a driver their age experiencing negative consequences (e.g., being arrested, having and accident) as a result of drinking and driving on a scale of 1(not very likely) to 4 (very likely).

Protective Behavioral Strategies Survey (PBSS). The PBSS (Martens, et al., 2005) is a 15-item self-report questionnaire that measures the degree to which college students engage in certain protective behaviors while drinking (using a designated driver, drinking slowly). Engagement in these behavioral strategies reduces consumption of alcohol and decreases negative consequences associated with drinking (missing class, trouble with police). Participants were asked to rate the degree to which they engage in these behaviors on a 6-point scale ranging from 1 (never) to 6 (always). The PBSS consists of three subscales: Stopping/Limiting Drinking, Manner of Drinking, and Serious Harm Reduction. Scores on each of these subscales have been shown to negatively correlate with alcohol use and alcohol-related negative consequences (Martens, et al., 2005; Martens, Pedersen, LaBrie, Ferrier, & Crimini, 2007). Internal consistency reliabilities range from .63 (Serious Harm reduction scale) to .73 (Manner of Drinking scale) and .81 (Limiting/Stopping Drinking scale).

Perceptions of Intoxication and Perceived Risk. Perception of intoxication were measured by a set of questions modeled after Gustin and Simons' (2008) vignettes. Participants were provided with the definitions for a standard drink. The drinking

scenarios were described as having consumed 2, 4, or 6 drinks in 1, 2, or 3 hours. After each of the nine possible scenarios, participants were asked to indicate if they would drive in this situation, and also to estimate their perceived level of intoxication and their perceived risk associated with drinking and driving ("Would you be below or above the legal limit to drive?" and "How dangerous is it to drive in this situation?").

Estimated Blood Alcohol Concentration (BAC). This measure asked the participants to make judgments about their level of intoxication in nine hypothetical drinking scenarios; therefore, this measure was adjusted by the participant's weight and gender. To calculate an estimate of the participant's BAC in each hypothetical drinking scenario, we used the number of drinks and the time taken to consume the drinks, as well as the individual's weight and gender. BAC was calculated using an updated version of the Widmark formula (see Hustad & Carey, 2005 for equation). Estimated BACs have been found to be predictive of actual BACs, though they are less predictive at higher blood alcohol levels (Carey & Hustad, 2002).

Procedure

Prior to their lab appointment, all participants completed an online survey that measured drinking and driving attitudes, behaviors and normative beliefs. Participants reported to the lab and a research assistant obtained written informed consent and obtained their weight in pounds by using a standard scale. Participants were randomly assigned to a priming condition (alcohol, danger, safety, or neutral word primes) and were told that they would complete a computer task followed by a packet of questionnaires asking about their beliefs and attitudes.

Participants completed a lexical decision task (LDT) that served as the priming mechanism. In this task they were presented with a series of letter strings on a computer screen and they were asked to indicate by pressing a computer key whether each letter sting is a word or not. Participants were given 110 LDT trials. Each trial began with the presentation of a fixation cross (+) in the middle of the computer screen for 1000ms, followed by a forward masking string (&&&&&&&&&&) for 400ms. Immediately following the masking string, participants were presented with a randomly selected word from one of the four priming conditions; this prime was presented for 40ms and was replaced with a backward masking string (XXXXXXXXX) for 400ms. The alcohol-related words included: drunk, booze, martini, beer, whiskey, cocktail, vodka, and liquor. The danger-related words included: accident, danger, injury, death, jail, DUI, arrest, and fine. The safety-related words included: safe, protect, shelter, secure, shield, guard, unharmed, and safeguard. Lastly, the neutral words (control condition) included: punch, water, juice, soda, shake, coffee, tea and lemonade. Following each backward mask string, participants were asked to indicate using buttons on a keyboard whether a string of letters (e.g., vivid or dulwl) was a word (by pressing the "Z" key) or not a word (by pressing the "/" key). Based on similar research using suboptimal priming methodologies, (e.g., Ortells, Daza, & Fox, 2003; Friedman et al., 2005; 2007) we concluded that the brief duration of our word primes, preceded and followed by masking primes, will not be consciously recognizable. To ensure that participants attended to the computer screen during the suboptimal prime, they were told that they will be presented with a series of visual stimuli right before the presentation of each letter string because we are interested in how the stimuli influence their performance on the task. Their job was to decide as

quickly as possible if each letter string is a word or not; they were asked to "get ready to respond" following the fixation cross presentation.

Immediately following the priming manipulation, participants were given a packet of questionnaires to complete. The first set of questions assessed their perceived level of intoxication and perceived risk associated with drinking and driving in hypothetical drinking scenarios as well as their willingness to drive in that particular situation. Following this, participants filled out the PBSS which measures the degree to which they engage in certain protective behaviors when drinking alcohol. The rest of the questionnaires measured their drinking behaviors, drinking and driving behavior, consequences, attitudes and normative beliefs. Participants were contacted via email four weeks following the experiment and they were asked to complete an online survey assessing their drinking and driving behavior in the past month. All participants were fully debriefed after the online survey.

RESULTS

Drinking Behavior.

Eighty-nine percent of our sample consumed at least one drink of alcohol in their lifetime and 71% of our sample consumed at least one drink of alcohol in the past month. Lifetime drinkers (n = 268) drank, on average, 4 days in the last month (M = 4.68, SD = 5.16) and consumed, on average, 3 drinks per drinking occasion (M = 3.44, SD = 3.12) in the past month. Drinking behavior, measured by past month drinking days, average drinks per drinking occasion, and consumption of 5 or more drinks, did not differ among experimental groups ($F(3,267)$ = .24, p = .87; $F(3,267)$ = .14, p = .94; $F(3,267)$ = .37, p = .78, respectively).

Drinking and Driving Behavior.

Seventy-eight percent of our sample reported driving at least once per month. Among lifetime drinkers (n = 268), 59% reported driving after consuming alcohol at least once in their lifetime, and 16% reported driving after drinking at our one month follow-up. Drinking and driving behavior did not differ among experimental groups ($F(3,266)$ = .37, p = .77). Drinking and driving was significantly correlated with both drinking frequency (r = .32, $p < .001$) and quantity (r = .34, $p < .001$) of alcohol use. Eighty percent of our drinking sample reported that at least two out of their three closest friends disapprove of drinking and driving (M = 2.45, SD = .91).

Estimating BAC levels.

Using the participants' weight and gender, we computed an estimate of their BAC levels at each of the nine hypothetical drinking scenarios in order to compare this estimate to their reported level of intoxication. BAC underestimation was relatively rare,

as only 20% of the lifetime drinking sample underestimated their BAC in one or more hypothetical drinking scenario.

Priming Effects on Perceived Intoxication and Perceived Danger.

Independent-groups *t* tests were used to test whether participants primed with alcohol words rated their level of intoxication and perceived danger in hypothetical drinking scenarios as lower compared to participants primed with neutral words. Level of intoxication was a measure of the total number of drinking scenarios participants endorsed being below the legal limit to drive. Perceived danger was assessed as the mean across the nine hypothetical drinking and driving scenarios. Both main effects were not significant (perceived intoxication: $t(136) = .66$, $p = .51$; perceived danger: $t(136) = .53$, $p = .60$).

Linear regression was used to test the interaction between alcohol word primes and drinking and driving attitudes and normative beliefs, on perceived level of intoxication and perceived danger. All four interactions were not significant. There was a main effect of drinking and driving attitudes on perceived intoxication ($\beta = -.30$, $p < .01$) and perceived danger ($\beta = .55$, $p < .001$). There were no significant main effects or interactions for danger or safety word primes.

Among participants who endorsed driving after drinking, we found a significant interaction (condition X attitudes) on perceived dangerousness ($\beta = .43$, $p < .01$). Probing this interaction indicated that the unstandardized simple slope was .59 (standardized = .70) for participants in the neutral condition and .12 (standardized = .15) for participants in the alcohol condition (see Figure 1).

Supplementary Analyses.

We conducted supplementary analyses using additional dependent variables: subjective reports of engagement in protective behavioral strategies and willingness to drive in hypothetical the driving scenarios. First, we tested whether alcohol, danger and safety primes impacted subjective reports of engagement in protective behavioral strategies when consuming alcohol. We did not find priming effects on these subjective reports.

The willingness to drive variable was assessed as the highest number of drinks a participant reported being willing to consume and still drive within two hours. The number of drinks was taken from the hypothetical drinking scenarios, thus, the response options were 0, 2, 4, or 6 drinks in two hours. Linear regression was used to test whether individuals primed with alcohol words indicated that they would be willing to drive after a higher number of drinks in hypothetical drinking scenarios compared to the control group, and if this effect was moderated by their attitudes about drinking and driving. This interaction was significant (β = -.26, $p < .05$). Probing this interaction indicated that the unstandardized simple slope was -1.25 (standardized = -.58) for participants in the neutral condition and -.50 (standardized = -.23) for participants in the alcohol condition (see Figure 2). This interaction was also significant for the drinking and driving sample (β = -.47, $p < .01$). The unstandardized simple slope was -1.61(standardized = -.68) for participants in the neutral condition and -.21 (standardized = -.09) for participants in the alcohol condition (see Figure 3). See Table 1 for a summary of the interaction effects on perceived danger and willingness to drive for both the lifetime drinking sample and the drinking and driving subsample.

Predicting Drinking and Driving Behavior.

Logistic regression was used to test the final hypothesis, that the alcohol primed group's answers to questions regarding their perceived danger associated with drinking and driving will be more predictive of drinking and driving behavior at follow-up. Perceived danger was predictive of drinking and driving at follow-up for lifetime drinkers (OR = .46, $p < .01$) but not for the drinking and driving sample (OR = .59, p = .12). However, interactions between prime condition and perceived danger were not significant for either sample (lifetime drinkers: OR = 1.32, p = .67; drinking and driving: OR = 1.74, p = .47). We found similar results when using participants' responses to questions regarding their willingness to drive. Willingness to drive was predictive of drinking and driving at follow-up for both the lifetime drinkers (OR = 1.76, $p < .001$) and the drinking and driving samples (OR = 1.54, $p < .001$). However, interactions between prime condition and willingness to drive were not significant for either sample (lifetime drinkers: OR = 1.12, p = .65; drinking and driving: OR = 1.02, p = .94).

DISCUSSION

The primary goal of this research was to test the effect of alcohol primes on judgments related to drinking and driving. Our results indicate that driving related perceptions were influenced by alcohol primes as a function of pre-existing attitudes about drinking and driving.

Our working conceptual model for the hypothesized priming effects was based on the spreading activation model (Collins & Loftus, 1975; Loersch & Payne, 2011), which stipulates that priming specific content increases the accessibility of related constructs, and in turn influences judgment and behavior (Friedman et al., 2005; 2007; 2009; Goldman et al., 1999; Roehrich & Goldman, 1995; Stein et al., 2000). Based on prior work with alcohol primes, we hypothesized that priming participants with alcohol words would increase the accessibility of alcohol related associations stored in memory (e.g., attitudes regarding drinking and driving), which would in turn influence their judgments about drinking and driving in a manner more consistent with those attitudes. However, our results show an opposite effect; drinking and driving judgments were strongly correlated with pre-existing attitudes in the neutral prime condition, but this correlation was not significant following alcohol primes.

Alternatively, results from this study may better fit a dual process model of alcohol cognitions (Stacy & Wiers, 2010), which suggests that behavior is influenced by both explicit and implicit cognitions. Stacy and Wiers suggest that under certain conditions the activation of implicit cognitions can lead to engagement in a behavior which is inconsistent with one's explicit attitude. This could explain the finding that,

following alcohol primes, participant's judgments about drinking and driving were less influenced by their pre-existing, explicit attitudes. Future research would be required to assess implicit cognitions about drinking and driving and explore whether alcohol primes influence judgments consistent with these cognitions.

Given that these effects are stronger for participants who report past drinking and driving behavior, it suggests that these participants have more access to drinking and driving related cognitions as well as stronger implicit cognitions regarding drinking and driving. This information may be activated following alcohol primes. This activation may impact their responses, such that they are responding in a manner more consistent with these implicit cognitions rather than their explicit attitudes. Similar findings have been shown regarding expectancy activation during marijuana priming, such that priming effects were only significant for participants who smoked marijuana in the past year (Hicks, Pedersen, McCarthy, & Friedman, 2009).

While we did not find the hypothesized significant effects of alcohol primes on perceived intoxication, these results are informative, suggesting that perceptions of intoxication might not be influenced by primes. Results also suggest that, following alcohol primes, perceptions about drinking and driving may not be based on explicit, declarative knowledge, as they are no longer correlated with prior assessments of such knowledge. Consistent with a dual process model, these perceptions may instead be based on implicit attitudes about the behavior. These results are also consistent with previous research showing that intoxication ratings made while under the influence of alcohol were no less accurate than anticipated intoxication ratings in hypothetical drinking scenarios made by sober participants (MacDonald et al., 1995). On the other hand,

perceived danger ratings may not be based on declarative knowledge, as it is no longer correlated with pre-existing attitudes.

Findings from this experiment are important for several reasons. Results from this study build upon already existing research, and provide evidence that alcohol related cues not only influence judgments about others (Friedman et al., 2005) but also judgments about engaging in a specific behavior. These results suggest that people's judgments can be altered by contextual primes, and that this effect is conditional on attitudes and past behavior. Despite the fact that drinking and driving attitudes are highly associated with drinking and driving behavior, the priming effect is so strong that attitudes and judgments are no longer correlated. Although generally people have negative attitudes about drinking and driving and they perceive the behavior as dangerous, there are still very high rates of engagement in the behavior. In the current study, over half of our participants endorsed ever drinking and driving, despite the fact that the majority of their friends disapprove of the behavior. Even though young adults who engage in drinking and driving see this behavior as more dangerous over time, they also perceive their peers as more accepting of this behavior over time (McCarthy & Pedersen, 2009). As actual drinking and driving decisions are made in the context of alcohol primes, our results suggest that the context in which people make this decision is one mechanism for maintaining this behavior, despite explicit negative attitudes towards it. Likewise, the extent to which alcohol intoxication can alter these perceptions is also important. Certainly, sober ratings of attitudes regarding drinking and driving are good indicators of the behavior, but if these attitudes change when people are intoxicated or in the presence of alcohol cues, it suggests that research must also measure implicit cognitions.

There are several limitations of this study. First, because this was not an alcohol administration study, we cannot conclude that these results mimic real life drinking and driving decision making. Future research should test the replicability of these effects in participants who are intoxicated. Recent research has demonstrated individual differences in alcohol's effect on drinking and driving judgments as a function of binge drinking status (Marczinski et al., 2008; Marczinski & Fillmore, 2009). An important direction for future research is to test whether individual differences in alcohol's effect on drinking and driving perceptions and judgments are associated with engagement in the behavior. Second, it is important to note that the majority of participants in this study were under the legal drinking age. It is possible that the drinking and driving decision making process is different for people over the age of 21, given that the context in which they are drinking is different (dorm vs. bar). However, despite the fact that drinking is an illegal activity for the majority of the sample used in this study, research has shown that drinking and driving is very prevalent among college students (Wechsler et al., 2003) (most of whom are under the legal drinking age), thus, studying factors that influence drinking and driving decisions is very important in this population.

The current study is a first step at explaining the discrepancy between attitudes and behaviors regarding drinking and driving. Past research has shown that implicit cognitions are better predictors of drinking behavior at follow-up (Stacy, 1997) when compared to more explicit measures. While this has not been tested for drinking and driving, it is possible that the activation of implicit cognitions while drinking predicts drinking and driving behavior better than explicit cognitions. Future research will need to investigate not only if this change in perceptions predicts drinking and driving behavior,

but also if a change or activation of implicit cognitions predicts future behavior. Our one month follow-up did not find that explicit cognitions following alcohol primes were more accurate predictors of actual behavior, however, we did not measure implicit cognitions, which could be a better predictor of behavior (Stacy, 1997). Lastly, future research needs to investigate other possible factors that might lead to this effect. For example, research has shown that several contingencies, such as distance to drive, impacts perceptions of risk associated with drinking and driving in both experimental and field studies (MacDonald et al., 1995). Alternatively, priming participants with alcohol words can activate other expectancies not specific to alcohol, such as risk taking or impulsivity, therefore, the effects on perceptions of danger and willingness to drive could be affected by these expectancies. In this study, we only examined the effects of alcohol primes on perceptions of risk related to drinking and driving and not other risky behaviors that are not associated with alcohol consumption, therefore, we cannot conclude that these effects are unique to drinking and driving judgments. Additionally, we cannot conclude that these effects are specific to alcohol word primes. If the mechanism by which these effects occur is by activation of risk taking expectancies, it is possible that other primes can have a similar effect, simply by activating these expectancies. Future research needs to tease apart the different mechanisms by which this effect can occur.

Table 1.

Linear regression analyses for perceived danger and willingness to drive ratings for the lifetime drinkers (n = 137) and the drinking and driving subsample (n = 82). The alcohol condition is the reference group.

	Lifetime Drinkers				Drinking and Driving Sample			
	B	*SE B*	*β*	R^2	*B*	*SE B*	*β*	R^2
Perceived Danger								
Step 1				0.30				0.25
Condition	0.12	0.09	0.10		0.14	0.12	0.11	
Attitudes	0.45	0.06	0.55*		0.42	0.08	0.50*	
Step 2				0.30				0.32
Condition	0.12	0.09	0.09		0.13	0.11	0.10	
Attitudes	0.35	0.09	0.43		0.12	0.13	0.15	
Condition X Attitudes	0.16	0.12	0.15		0.46	0.16	0.43#	
Willingness to Drive								
Step 1				0.19				0.21
Condition	-0.21	0.25	-0.06		-0.32	0.35	-0.09	
Attitudes	-0.95	0.17	-0.44*		-1.09	0.24	-0.46*	
Step 2				0.22				0.29
Condition	-0.20	0.24	-0.06		-0.30	0.33	-0.08	
Attitudes	-0.50	0.26	-0.23		-0.21	0.37	-0.90	
Condition X Attitudes	-0.75	0.34	-0.26+		-1.40	0.47	-0.47#	

+$p < .05$. #$p < .01$. *$p < .001$.

FIGURES

Figure 1.

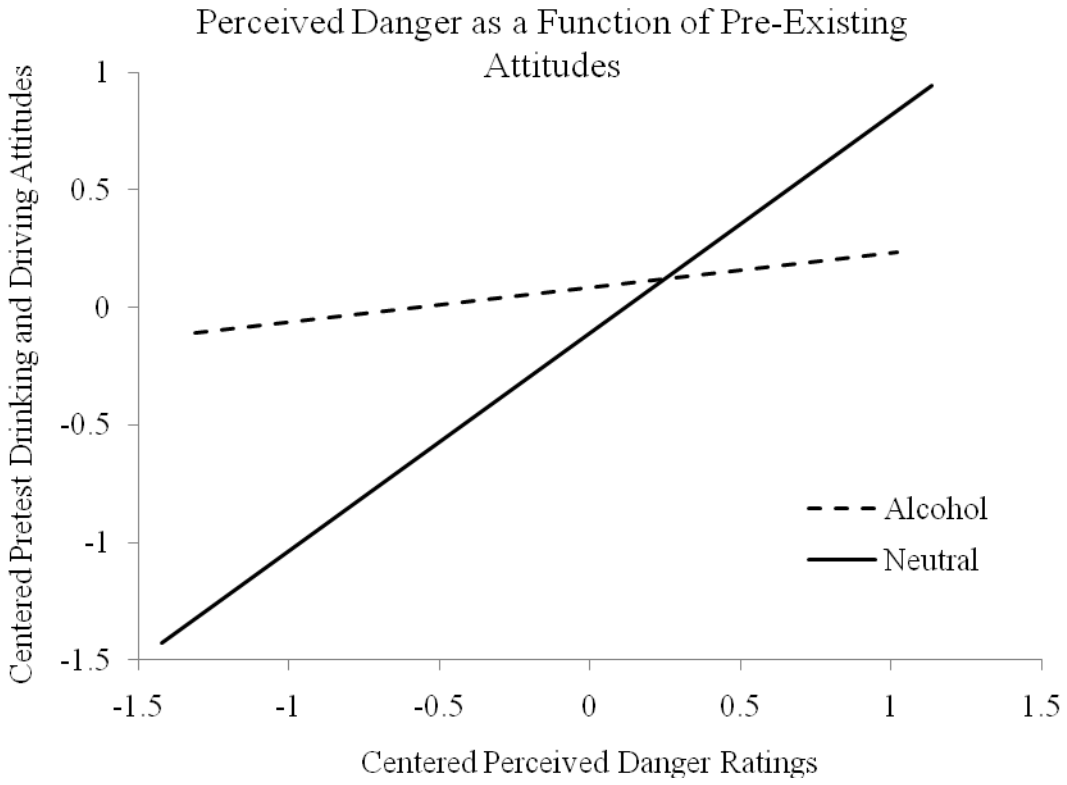

Figure 1. Simple slopes for perceived danger (mean = 2.86, on a 4 point scale) as a function of pre-existing drinking and driving attitudes (mean = 2.67, on a 4 point scale). These data are for participants who report drinking and driving (n = 82).

Figure 2.

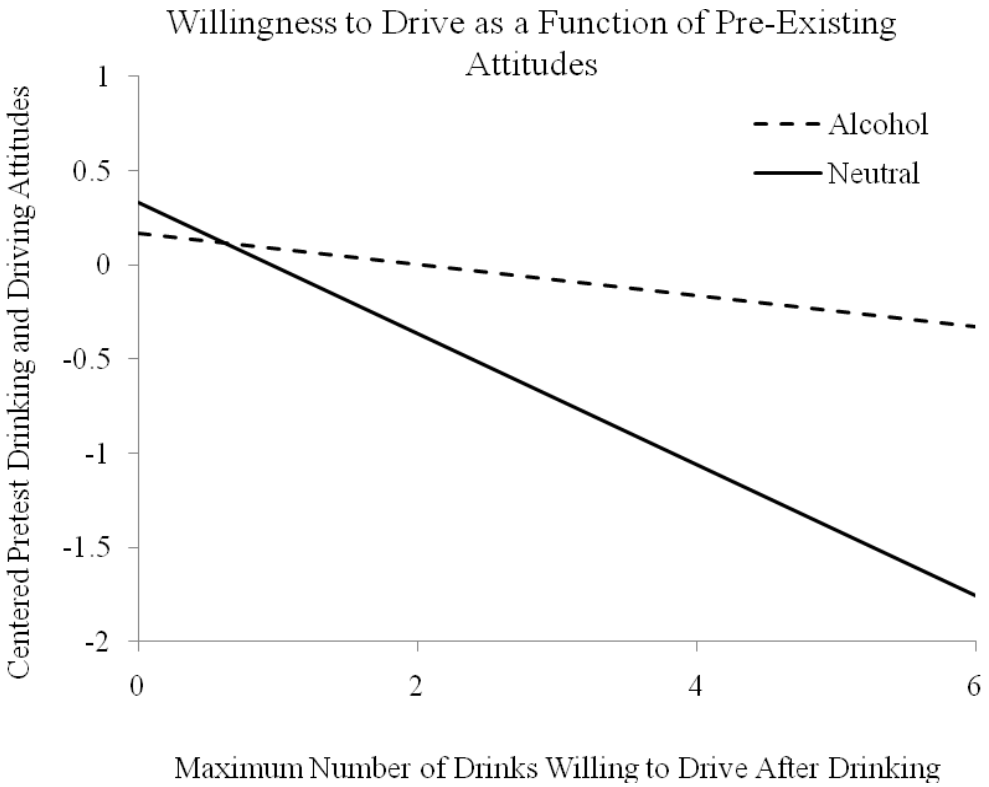

Figure 2. Simple slopes for willingness to drive as a function of pre-existing drinking and driving attitudes (mean = 2.81, on a 4 point scale). These data are for lifetime drinkers (n = 137).

Figure 3.

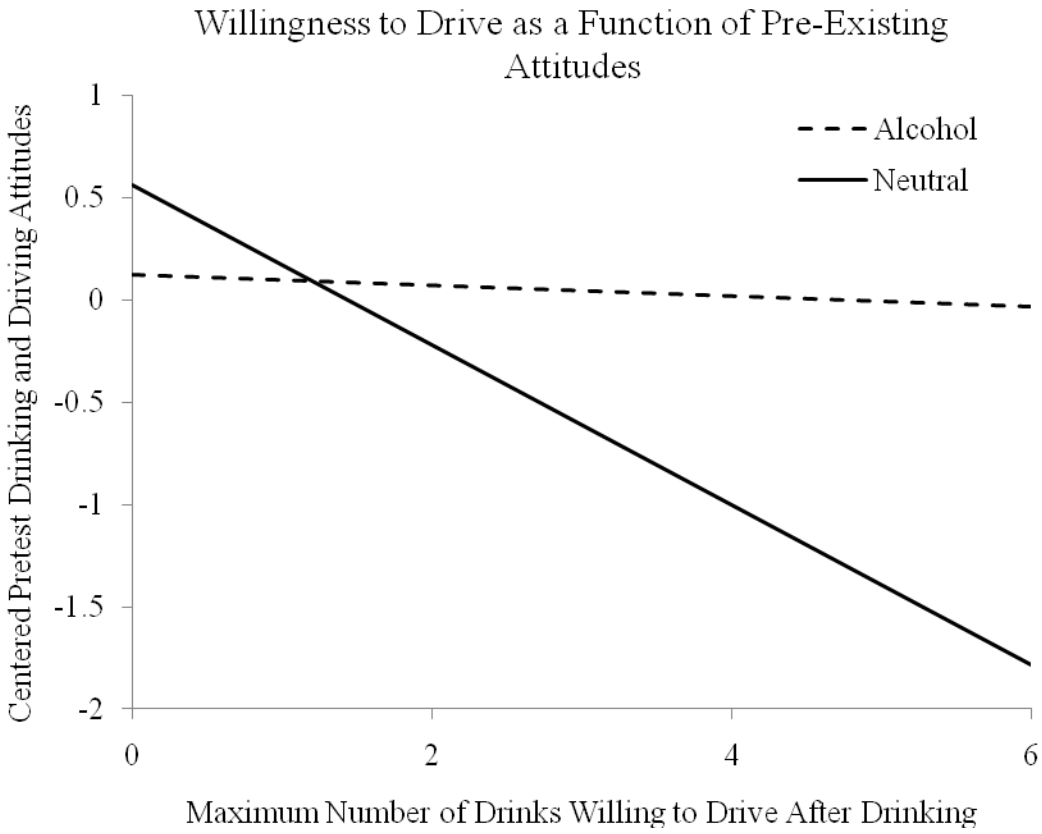

Figure 3. Simple slopes for willingness to drive as a function of pre-existing drinking and driving attitudes (mean = 2.67, on a 4 point scale). These data are for participants who report drinking and driving (n = 82).

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