

RUNNING HEAD: BrAC and Driving

BREATH ALCOHOL CONCENTRATION AND DRIVING: THE BRAC AND  
CONFIDENCE OF DRIVERS AFTER DRINKING IN DOWNTOWN GREENVILLE

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**Abstract**

Consumption of an alcoholic beverage has been proven time and time to have a negative affect on one's cognitive functioning (Phillips & Brewer, 2011). The current study attempted to explore the confidence of bar patrons' ability to drive after consuming alcohol. Two nights were selected during the Fall of 2015 for collection of data. Patrons (N=568) in the area of downtown Greenville, a college town with a plethora of bars, were interviewed and given a brief survey between the hours of 10:30 P.M. and 2:00 A.M. The survey included: demographics, alcohol behaviors, and confidence in their ability to drive. Following the survey, the breath alcohol concentration (BrAC) of the participant was recorded. The mean BrAC of those who did not feel confident in their ability to drive was 0.09% ( $SD=0.05$ ) while the mean BrAC of participants who did feel confident in their ability to drive was 0.05% ( $SD=0.49$ ). These results indicated there was a significant relationship between breath alcohol concentration and their confidence in their ability to drive after consuming alcohol ( $\chi^2=70.383$ ,  $p<0.001\%$ ) with a medium effect size (Cramer's  $V=0.357$ ). Established by these results, bar patrons in Greenville, North Carolina are confidently deciphering if they should or should not drive after alcohol consumption; however, as indicated by previous studies, drinking and driving is still a prevalent problem.

## 1. Literature Review

Drinking on college campuses is almost a social norm, with the prevalence equating to more than 50% of college students have had a drink in the last month (NIAAA, 2015). Excessive and binge drinking on college campuses is thought to be a cause of a majority of the risky behaviors performed by college aged kids. Some examples of these behaviors include drug use, sexual promiscuity, and one of the most common, driving under the influence. Drinking and driving among college students is high. One study found that one in every three college aged students admitted to regularly drinking and driving (Wechsler, Lee, Nelson, and Lee, 2003). The National Institute of Alcohol Abuse and Alcoholism (2015) estimates that 4.8 million people age 18-24 drunk drive each year.

Different characteristics have been studied to have different effects on the likelihood of drinking and driving. Students of age, 21 and over, are usually more likely to participate in heavy drinking and driving rather than students who are underage, as indicated by the 20% increase in prevalence of drinking and driving between the under 21 age group and the 21-23 age group (Wechsler, 2003). Despite of this increase in prevalence, crashes from the under 21 age group are more prevalent after drinking (Peck, Gebers, Voasm, & Romano, 2008). Different factors are thought to contribute to this disparity. One hypothesis is those underage have less experience driving and alcohol would greater impair those with less drinking experience (Peck et al., 2008). Another proposition is the younger the drinker is, the aptitude they have in assessing a situation and making a smart decision is less than that of someone older (Peck et al., 2008). Extrinsic motivational factors also play a role in the age of students who drink and drive. All states have a different set legal limit for underage drivers, known as “Zero Tolerance Laws” (Alcohol Policy Information System, 2015). In fourteen states and the District of Columbia, a minor can receive a DUI for having any alcohol in their system, or a 0.00% BrAC (Alcohol Policy Information

System, 2015). Every state has a limit of some kind for minors under 0.02%, mandated to receive federal highway funding (Alcohol Policy Information System, 2015). The punishment for underage drivers being more extreme is thought to account for their motivation to not drink and drive as frequently as those over 21 years of age (Peck et al., 2008).

Gender, race, living arrangement, Greek life affiliation, year in school, and high school binge drinking habits have been shown to greatly influenced drinking and driving habits (Wechsler, 2003). White males involved in Greek organizations were found to have the highest incidence of driving after drinking (Wechsler, 2003). Living arrangements also played a large factor in the likelihood of drinking and driving. Students who lived in dormitories or with parents were less likely to drive than those who lived off campus or in Greek housing (Wechsler, 2003). Habitual drinking patterns also increased the likelihood of driving under the influence. One day of heavy binge drinking in the past thirty days showed a quadruple increase in the drinking and driving (Fairlie et. al., 2010). Individual college and university characteristics were also evaluated in literature, but there was no great indication that college characteristics factored into likelihood of students drinking and driving. Missing from the literature was a review of whether or not BrAC level factored into the confidence their ability to drink and drive. This is an important factor because the increased confidence in their ability to drive, might lead to an increase in their likelihood to drive.

Previous reviews of literature show that impairment is great enough to decrease not only cognitive functioning, but motor skills and reaction times, at approximately 0.05% (Moskowitz & Fiorentino, 2000). There is also evidence to suggest that crash risk increases exponentially with increasing BrAC (Keall, Frith, & Patterson, 2004). Further, for each increase of 0.02%, one study found the likelihood of a crash occurring would double (Keall, Frith, & Patterson, 2004).

Other studies suggest, that impairment is significant with a BrAC low as 0.03% and the rise between crashes and impairment can greatly increase at a BrAC of 0.01% (Phillips & Brewer, 2011). There is also variation among countries for standard legal limit. In the United States there are Per Se Offense laws. Technically this allows states to decide what is the legal limit drivers must remain under, but in order to receive federal funding for highways a state's legal limit to drive has to be 0.08%; however, in other countries like Sweden it is as low as 0.02% (Steward & Sweedler, 2008). This limit is an important measure, especially when analyzing car crashes after drinking and driving and the factors that contribute to these decisions. When comparing BrAC and crash risk, the increase is exponential (Fairlie et. al., 2010). Among all drivers, one study found that those with a higher BrAC, even as little as 0.04%, were significantly more likely to be in an alcohol crash than those with a lower BrAC (Fairlie et. al., 2010). Among college related deaths, those stemming from alcohol related crash made up 79% in 2006 (Fairlie et. al., 2010). In comparison 41% of all traffic deaths in 2006 were related to alcohol (Fairlie et. al., 2010). It becomes evident how drinking and driving is such a problem among college aged populations.

The purpose of the current study is to analyze the confidence of bar patrons who had been drinking and their ability to drive. After consumption of alcohol, one's confidence could increase. This increased confidence might in turn lead to an increased risk of patrons driving. It is also possible that those with a BrAC below the legal limit who have been drinking might be less confident in their ability to drive, opposed to those with a higher BrAC. Therefore, it is hypothesized that cognitive functioning decreases with intake of alcoholic beverages, the confidence in one's ability to drive will increase with intake of alcoholic beverages. In addition, it is hypothesized certain characteristics of the population, such as age and gender, will influence the confidence of subjects.

## 2. Methods

A field study was performed to observe if there was a relationship between consumption of alcoholic beverages and the confidence in the ability to drive after drinking. This study was performed in a college town, in an area with close proximity to bars and restaurants. Both undergraduate and graduate students received training in conducting private, anonymous surveys, who then went out to collect data. This study was approved by the Institutional Review Board.

During the Fall 2015 semester two days were selected when traffic through the designated downtown area would be highest. The graduate and undergraduate researchers dispersed in small groups among the downtown area of the college town to collect data between the hours of 11pm and 2am. Surveyors asked for verbal consent by participants, after giving a brief overview of the study and the purpose. The only requirement for participants was to be age 18 years or older. The survey conducted was face to face with one surveyor and one participant. Items surveyed included demographics, plan for getting home, current confidence in their ability to drive as well as the BrAC reading. Additionally, the survey included questions based off the AUDIT-C, a three item instrument to diagnose hazardous alcohol behaviors (Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998).

After the verbal survey was completed, participants provided a breath sample to measure the BrAC of the participant using a Alco-Sensor IV, intoximeter, Inc. To ensure a more accurate read, all participants were asked to wash their mouths out with clean water if an alcoholic beverage was consumed in the last ten minutes. The BrAC was recorded and the participant was given a range to indicate where their BrAC fell (less than 0.02, 0.02 to < 0.08, or greater than 0.08). When the survey and breathalyzer were complete the participants received information

about safe ways to get home and a voucher for a free hot dog. The completed surveys were then collected, entered into SPSS, and a data analysis was performed.

## 2.1 Measures

### 2.1.1 Demographics

Demographics were considered including: age, sex, race, and college attendance. If participants were actively in school, their school of attendance, class rank, and Greek affiliation were recorded as well.

### 2.1.2 Plan for Getting Home

The participants plan for a way from the bar district was recorded. Response choices were *no plan yet, bus, cab, ride home with a non-drinking friend/DD, ride with a friend who has been drinking, walk, drive myself home, or other*, where students were asked to provide an alternative for how they intended on getting home.

### 2.1.3 Alcohol Behaviors

A series of questions was asked to measure the typical hazardous alcohol usage behaviors among participant based on the AUDIT-C (Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998). This included the number of typical times intoxicated over the last year with answer choices of: *never, monthly or less, 2-4 times a month, or more than 4 times a month*. The frequency of consumption of any alcoholic beverage was also recorded with response variables being *never, monthly or less, 2-4 times a month, 2-3 times a week, or 4 or more times a week*. The typical number of standard drinks consumed a day was recorded. A chart was provided to the participant to quantify what was a standard drink. The responses for this included *none, 1 or 2, 3 or 4, 5 or 6, 7 to 9, or 10 or more*. The frequency in which the participants participated in binge drinking (6

or more drinks) during one occasion was measured with the options of *never, less than monthly, monthly, weekly, or daily or almost daily.*

### *2.1.5 Confidence to Drive*

To measure the confidence of participants driving ability they were asked to rank their level of agreement with the statement: “If I drive home tonight, I am confident I will get home safely.” Their responses were measured by choices of *strongly disagree, disagree, agree, or strongly agree.*

### *2.1.6 BrAC*

The BrAC of each participant was recorded after they provided a breath sample. The exact BrAC was recorded. For data analysis purposes, the BrAC range was recoded into three categories of *less than 0.024, 0.025 to 0.074, and 0.075 and higher.*

## *2.2 Data Analysis*

In order to view the demographics of the studied population descriptive frequencies were used for age, race, gender, and legal drinking status (over or under 21) as well as the mean BrAC. The confidence question “if I drive home tonight I will get home safely” was analyzed as well with descriptive frequency but the answer choices were divided into two dichotomous variables of *agree* or *disagree*. The age of participants was also divided into a dichotomous variable to represent those over legal drinking age (21 and over) and those underage. A t-test was then used to compare the difference in the means between these two variables. Chi-square tests were run to compare different populations answers to the survey question including: gender and confidence, BrAC range and confidence, and over or under 21 and confidence.

## **3. Results**

### *3.1 Study Population*

The population (N=568) was majority males (63.00%) over the legal drinking age of 21 (63.60%). The mean age of the participants was 21.61 ( $SD=3.78$ ).

Table 1

<b>Sample Characteristics (N=568)</b>	
Mean Age	21.61 ( $SD=3.78$ )
Gender	
Males	63.00% (N=358)
Females	37.00% (N=210)
Race/Ethnicity	
White	69.70% (N=396)
Black	15.00% (N=85)
Other	14.70% (N=84)
Legal Drinking Status	
Under 21	35.40% (N=201)
21 or older	63.6% (N=361)
Mean BrAC	0.07 ( $SD=0.053$ )

A majority of the population reported drinking alcohol 2-3 times a week or 2-4 times a month (63%). While 42% of the population reported having no drinks on a typical day, nearly 34% reported having 6 or more drinks on one occasion (binge drinking) weekly. The mean BrAC of the overall population was 0.07 ( $SD=0.05$ ).

### 3.2 Confidence Driving Home

When dividing the collected data into a dichotomous variable of agree or disagree, more than half of participants (53.80%) disagreed with the statement: “If I drive home tonight I will get home safely” and 46.00% agreed with the statement. There is a statistical significance difference found in the mean BrAC of those who agreed and disagreed with the statement ( $t=70.40, p<.001$ ). The participants who disagreed with the statement had a mean BrAC of 0.09 ( $SD=0.05$ ) while those who agreed had a mean BrAC of 0.05 ( $SD= 0.49$ ).

### 3.3 Gender, Age, and BrAC Range and Confidence Driving Home

More males reported being confident in their ability to arrive home safely, however there was no significant relationship found between gender and confidence in driving home ( $X^2=2.960$ ,  $p=0.085$ ). There was also no significant relationship found between the dichotomous age variables (over and under 21) and confidence in driving ( $X^2=0.093$ ,  $p=0.761$ ). There was a significant relationship between the range of the BrAC and the confidence of participants ( $X^2=70.383$ ,  $p < 0.001$ ) with a medium effect size (Cramer's  $V=0.357$ ). A significant relationship was also observed between the confidence of drivers under 21 and the BrAC range ( $X^2=47.426$ ,  $p < 0.001$ ) with a medium effect size (Cramer's  $V=0.492$ ) as well as the confidence of drivers over 21 and the BrAC range ( $X^2=28.248$ ,  $p < 0.001$ ) with a medium effect size (Cramer's  $V=0.284$ ,  $p < 0.001$ ).

### *3.4 Hazardous Drinking and Confidence Driving Home*

Using the AUDIT-C questions, a significant relationship was exhibited between the frequency of having a drink containing alcohol and the driving confidence of participants ( $X^2=14.918$ ,  $p = 0.005$ ) with a small effect size (Cramer's  $V=0.162$ ,  $p < 0.001$ ). Another significant relationship was found between frequency of binge drinking and confidence of driving ( $X^2=23.836$ ,  $p < 0.001$ ) with a small effect size (Cramer's  $V=0.205$ ,  $p < 0.001$ ). There was no significant relationship between average number of drinks in a day and confidence in driving.

## **4. Discussion**

The purpose of this study was to examine if a relationship was present between the BrAC of an individual who had consumed alcohol and their confidence in their own ability to drive home and arrive safely. Different characteristics were also observed to see if they contributed to being more confident after drinking. More than half of the sample population reported they were not confident if they drove home they would arrive safely (53.80%). Those who reported not

being confident in their driving ability had a mean BrAC of 0.09 ( $SD=0.05$ ), indicating they were aware they would be above the legal limit and safe limit to drive. The participants who reported they were confident they could drive home safely had a mean BrAC of 0.05 ( $SD=0.49$ ). These results are an indication perhaps the research participants can correctly decipher if they are too intoxicated to drive.

Gender did not present a significant relationship with participant's confidence in driving ability; however, more males reported they felt confident driving home (30.80%). The dichotomous age variable, over or under legal drinking age, also did not show a significant relationship to confidence driving. There was a significant relationship between the range of the BrAC and the confidence in participants driving ability. Approximately 32% of participants who's BrAC was over 0.075 disagreed they would make it home safely if they drove, while only 15.4% of those with a BrAC over 0.075 agreed they would indeed safely make it home if they drove. These results do indicate the overall population's ability to discern whether or not they should drive, yet there are still a number of participants who felt they could drive even though they were close or over the legal limit. The increased confidence of drivers over 21 might be due in part to the Zero Tolerance Law in the state of North Carolina.

Since the sample used was a convenience sample done in a very specific geographical area with a college located in close proximity to the studied area, this study presents limitations that should be taken into account. First, this sample may not give a representation of the general population. There was also a smaller sample size used than was originally intended due to inclement weather. In specific regards to the question about participant's confidence driving home, there were several limitations. All of the data being self-reported leaves some limitation to how accurate the information received is as well.

This study demonstrated that bar patrons might be able to decipher their ability to drive after drinking, but there are still bar patrons who are confident in their ability to drive after drinking even though they had a BrAC over the legal limit. An additional analysis and field study should also be done to analyze the motor skills at different BrAC and if frequency of consumption increases participant's motor skills when under the influence of alcohol. Other studies and data analysis should be done to analyze if 0.08% is an acceptable legal limit. If crashes are significantly more likely at 0.08% than a lower BrAC, states could look into lowering legal limits for driving to discourage drivers from making unsafe decisions about driving after drinking. Comparing data to the age of drivers could observe the effectiveness of Zero Tolerance Laws.

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