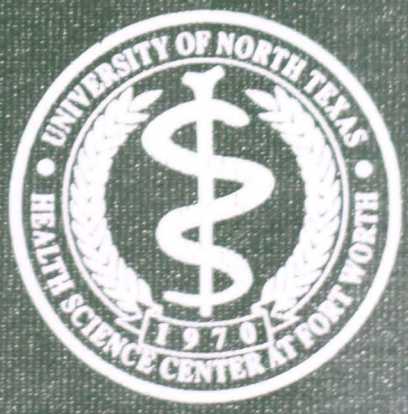
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IS THERE A RELATIONSHIP BETWEEN IMPULSIVENESS, RISK PERCEPTION, ALCOHOL PROBLEMS, RACE/ETHNICITY, AND ALCOHOL-RELATED INJURY TYPE?

APPROVED:

Major Professor

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THESIS

Presented to the School of Public Health

University of North Texas
Health Science Center at Fort Worth

in Partial Fulfillment of the Requirements

for the Degree of

Master of Public Health

By

Cara Hamann, B.S.

Fort Worth, Texas

May 2006

Title: Is there a relationship between impulsiveness, risk perception, alcohol problems, race/ethnicity, and alcohol-related injury type?

Cara J. Hamann [a,b,*], Kathryn Cardarelli [a], Craig Field [b], Lori Fischbach [a], Swati Biswas [a]

[a]University of North Texas Health Science Center, 3500 Camp Bowie Blvd., Fort Worth, Texas, USA 76107
[b]University of Texas Houston Dallas Regional Campus, 6011 Harry Hines Blvd., Dallas, Texas, USA 75235

*Corresponding author: Tel.: 214 648 4299 E-mail address: cara.hamann@utsouthwestern.edu (C. Hamann)

Abstract

This cross-sectional study examined the associations between impulsiveness, risk perception, alcohol problems, race/ethnicity and alcohol-related intentional injury of 1504 White, Black, and Hispanic trauma patients from the emergency department at a Level 1 Trauma center in Dallas, Texas. After controlling for race/ethnicity, age, gender, education, marital status, drug use, and annual frequency of heavy drinking, injury-related alcohol problems within the past 12 months (OR = 1.10, 95% CI 1.02-1.18) had a moderate effect on intentional injury. Impulsiveness (total score, motor, and non-planning) and alcohol problems (total score, physical, interpersonal, social responsibility, and injury) had moderate effects on intentional injury in univariate analyses, but these effects became null in multivariate analyses. Race/ethnicity had a large effect on injury type in all models considered in the study, with Blacks (estimated ORs ranged from 3.06 to 3.54, 95% CIs ranged from 2.08 to 5.18) and Hispanics (estimated ORs ranged from 2.29 to 2.47, 95% CIs ranged from 1.61 to 3.52) having greater odds of intentional injury in comparison to Whites in univariate and all multivariate analyses. Overall, race/ethnicity and injury-related alcohol problems were the only variables of interest that showed effects on intentional injury. Lack of significant results may be partially explained by the use of ICD-9 codes to categorize injury type. Future studies should address limitations and alternatives of using ICD-9 codes to evaluate psychological and behavioral factors.

Keywords: Intentional injury, impulsiveness, risk perception, alcohol problems, injury type, trauma

1. Introduction

In the United States injury is the leading cause of death for ages 1 to 44 and the fifth leading cause of death for all ages (CDC, 2002). Injuries in the United States bring an estimated 40 million people to the emergency department each year, with the most common causes being automobile accidents, violence, and falls (CDC, 2000). Within the peer-reviewed literature there is agreement that alcohol use is a risk factor for traumatic injury, both intentional and unintentional and alcohol use is also the risk factor for injury most frequently investigated (Borges et al., 1998; Cherpitel et al., 2004, Vinson et al., 2003, Watt et al., 2005). In addition to alcohol use, previous research has demonstrated there are other behavioral and psychological risk factors that play a role in injury, such as impulsiveness, risk perception, and alcohol problems (Barratt, 1993; Borges et al., 1998; Brown et al., 1980; Cherpitel et al., 2004; Dom, 2005; Field & O'Keefe, 2004; Fromme et al., 1993; Goldman et al., 1987; Katz et al., 2000; Michalsen, 2003). Previous research has also demonstrated variations across race and ethnicity in terms of injury and alcohol use (Caetano & Clark, 1999).

The current study explored the associations between alcohol problems, impulsiveness, risk perception, race/ethnicity, and alcohol-related injury type (intentional and unintentional). The current body of literature and intervention methods concerning alcohol-related traumatic injury focuses on alcohol use, abuse, and dependence and does not take into account the type of the injury in relation to other psychological, behavioral, and racial/ethnic risk factors. This focus may limit success of prevention efforts because these interventions may not work for everyone and may not be adequate. For this reason it is important to look at the effect of race/ethnicity and other behavioral and psychological

characteristics on injury type, in order to intervene more effectively to prevent alcohol-related injuries and reduce alcohol-related injury recidivism.

We used data from the University of Texas Houston's ongoing clinical trial titled, The Multidisciplinary Approach to Reduce Injury and Alcohol (MARIA) Project (PI: Caetano, R01 AA013824) for the current analysis. This cross-sectional study had five aims and corresponding hypotheses. The first aim was to determine the effect of impulsiveness on intentional injury with the hypothesis that the odds of intentional injury would increase for every one unit increase in impulsiveness score (as measured by the Barratt Impulsiveness Scale – 11; Patton et al., 1995)).

The second aim was to determine the effect of alcohol problems on intentional injury with the hypothesis that the odds of intentional injury would increase with every one unit increase in alcohol problems score (as measured by the Short Inventory of Problems; Miller et al., 1995).

The third aim was to determine the effect of risk perception (as measured by the Cognitive Appraisal of Risky Events; Fromme et al., 1997) on intentional injury with the hypothesis that with every one unit increase in risk perception would decrease the odds of intentional injury.

The fourth aim was to determine the joint effect of impulsiveness and risk perception on intentional injury and the joint effect of impulsiveness, risk perception, and alcohol problems on intentional injury. The hypothesis was that impulsiveness and risk perception would be associated with intentional injury after controlling for one another but their relationships with intentional injury would be modified by the presence of alcohol problems. With every one unit increase in impulsiveness and every one unit decrease risk

perception we hypothesized there would be an increase in odds of intentional injury and this would be modified by the alcohol problems variable.

The fifth aim was to examine the effect of race/ethnicity on intentional injury. We hypothesized that Blacks and Hispanics would have greater odds of intentional injury in comparison to Whites.

1.1 Hypothesized Causal Mechanism

It was hypothesized that the lack of thinking about the future, acting without thinking, and making quick cognitive decisions, associated with non-planning, motor, and cognitive impulsiveness and overall impulsiveness lead to increased odds of intentional injury (See Figure 1). Low risk perception of negative consequences of illicit drug use, heavy drinking, and aggressive and illegal behaviors was hypothesized to be associated with intentional injury (See Figure 1). Physical, social responsibility, interpersonal, intrapersonal, impulse control, and injury alcohol-related problems were thought to be associated with intentional injury (See Figure 1). It was also hypothesized that race/ethnicity, gender, education, income, marital status, drug use, and heavy alcohol use are also independent risk factors for intentional injury and are associated with impulsiveness, risk perception, and alcohol problems (See Figure 1).

2. Materials and Methods

The data source for this study, University of Texas Houston's MARIA Project (R01 AA013824), is an ongoing randomized clinical trial funded by the National Institute on Alcohol Abuse and Alcoholism (NIAAA; PI: Caetano, R01 AA013824). The aim of the MARIA Project is to examine the efficacy of a brief alcohol intervention, using motivational interviewing and harm reduction techniques, applied in a trauma care setting

among Whites, Blacks, and Hispanics (PI: Caetano, R01 AA013824). Randomization of subjects for the MARIA Project was computed via permuted block design in order to ensure an equal proportion of Blacks, Whites, and Hispanics within both the brief intervention (experimental) and standard care (control) groups (PI: Caetano, R01 AA013824). In order to complete the trial, each participant in the MARIA Project completes an initial assessment interview at time of enrollment and two follow-up interviews at 6 and 12 months from their date of enrollment (PI: Caetano, R01 AA013824). Six and twelve month follow-up interviews are still underway (PI: Caetano, R01 AA013824). The MARIA Project has institutional review board approval from both the University of Texas Health Science Center Houston and the University of Texas Southwestern (PI: Caetano, R01 AA013824). The current study utilized the initial assessment interview data from 1504 participants.

2.1 Participant Selection Criteria

All participants were recruited in the emergency department of a Level 1 Trauma Center in Dallas, Texas, between May 2003 and May 2005 (PI: Caetano, R01 AA013824). The catchment area of Parkland Hospital emergency department is Dallas County plus any surrounding area patients who need care from a Level 1 trauma facility. Patients who presented for treatment of injuries due to motor vehicles, motorcycles, all-terrain vehicles (ATV), boats, airplanes, animals, falls, violence-related injury such as stab, gunshot (any gun except shot guns), and shot gun (shot guns only) wounds, other assault related injuries, poisonings, contusions, concussions, strains, and sprains were screened for inclusion in the study (PI: Caetano, R01 AA013824).

In order to be eligible and enroll in the study a patient had to be 18 years of age or older, provide informed consent, be Health Insurance Portability and Accountability Act (HIPAA) informed, and report that their race/ethnicity was best described as either White, Black or Hispanic (PI: Caetano, R01 AA013824). People who fit into race/ethnicity categories other than White, Black, or Hispanic were excluded in order to ensure a large enough sample size in each category to have adequate power for analysis of the MARIA Project, for which the data were originally collected (PI: Caetano, R01 AA013824).

All enrollees also met one or more of four criteria (PI: Caetano, R01 AA013824). The first criterion determined any clinical indications of alcohol use including: positive blood alcohol concentration, report by clinician or emergency department staff of smell of alcohol on clothes or breath, intoxicated appearance, report by EMS of alcohol use or containers at site of injury, reports by friends or family of alcohol use, or any other signs of alcohol use. The second positive screen criterion was a yes to the question, "Were you drinking today (or before you were injured)?" The third criterion gathered information on drinking habits. Patients included were men who drank more than 14 drinks per week or more than 4 per occasion and women who drank more than 7 drinks per week or more than 3 drinks per occasion. Finally, the fourth positive screen criterion was any question answered "yes" on the CAGE (Mayfield et al., 1974) screening instrument. Enrollees were also required to have a Glasgow Coma Score (GCS) (Teasdale & Jennet, 1974) of 14 or higher on a scale of 3 to 15 at the time of interview. The GCS score is derived from three criteria: eye, verbal, and motor response (Teasdale & Jennet, 1974). This helped clinicians determine if patients were in appropriate condition to be interviewed. Patients who were too

intoxicated or not medically stable at the time of admission were monitored and asked to participate in the study once they were sober, as determined by study clinicians.

2.2 Measurement of impulsiveness

Impulsiveness was measured using the Barratt Impulsiveness Scale Version 11 (BIS-11; Patton et al., 1995). This scale produces a total score and three subgroups of impulsiveness: cognitive, motor, and non-planning. Cognitive impulsiveness is defined as making quick cognitive decisions (Patton et al., 1995). Motor impulsiveness is characterized as acting without thinking (Patton et al., 1995). Non-planning impulsiveness is defined as lack of thinking in terms of the future or having a "present orientation" (Patton et al., 1995). Higher scores indicate greater impulsiveness (Patton et al., 1995).

2.3 Measurement of alcohol problems

Alcohol problems were measured using the Short Inventory of Problems (SIP) (Miller et. al., 1995) plus six additional questions relating to injury. The SIP is a 15-item, short version drawn from a larger instrument called the Drinker Inventory of Consequences (DrInC; Miller et al., 1995), which contains 50 items. The six extra questions were also drawn from the DrInC (Miller et al., 1995). This instrument gives a total score of problems and six problem subscales: Physical, Interpersonal, Intrapersonal, Impulse Control, Social Responsibility, and Injury (Plus 6; Miller et al., 1995). The alcohol problem data referred to the 12 months prior to the date of enrollment into the study. Higher scores indicate more alcohol-related problems.

2.4 Measurement of risk perception

Risk perception of negative consequences was measured by the Cognitive Appraisal of Risky Events (CARE) questionnaire (Fromme et. al., 1997). The CARE is a 30-item

instrument with six subgroups: illicit drug use, aggressive and illegal behaviors, risky sexual activities, heavy drinking, high risk sports, and academic/work behaviors. MARIA Project participants were asked 15 of the 30 items, which made up the three subgroups most related to alcohol and injury (illicit drug use, aggressive and illegal behaviors, and heavy drinking). Each unit increase in total score indicates a greater perception of negative consequences.

2.5 Measurement of injury type

Injury type was based on medical diagnosis using the International Classification of Diseases (ICD-9). MARIA Project clinicians obtained ICD-9 data from medical records and coded these answers into categories for MARIA Project use (PI: Caetano, R01 AA013824). Those categorized under assault, gun shot wound, shot gun wound, and stab wounds were classified as intentional injuries. Injuries caused by ATVs, animals, motorcycles, falls, airplane, electricity, machine, motor vehicle collision, motor vehicle and person collision, skating, bicycle, boat, burn, sport, and other, were classified as unintentional.

2.6 Sociodemographic characteristics and other potential confounders

Demographic variables included and potential confounders controlled for in the analysis were: race/ethnicity, age, gender, education, marital status, drug use (within last 12 months), and alcohol use (frequency of 5+ drinks per occasion). Data on income, occupation, and weekly alcohol volume were also collected and examined to better understand characteristics of the study population.

Weekly alcohol volume was calculated using the basic quantity/frequency approach (Dawson, 2003) by multiplying usual quantity of drinks per occasion by frequency of

drinking and then by 0.6, which is the typical amount of ethanol found in one standard drink. One standard drink was considered 12 ounces of beer, 5 ounces of wine, or 1.5 ounces of hard liquor (Dawson, 2003).

3. Data Analysis

The means, standard deviations, F-tests, and corresponding p-values for total score and subscale scores of impulsiveness, risk perception, and alcohol problems were calculated. Counts, proportion of all injuries, proportion with intentional injury, Chi-square tests and corresponding p-values were calculated for sociodemographic variables including: age, gender, race/ethnicity, education, income, occupation, marital status, drug use, and alcohol use (weekly volume and frequency of heavy drinking).

Twenty-four univariate logistic regression models were run separately for each of the following predictors: impulsiveness (total score, cognitive, motor, and non-planning), alcohol problems (total, physical, interpersonal, intrapersonal, impulse control, injury, and social responsibility), risk perception (total, illicit drug use, aggressive and illegal behaviors, and heavy drinking), race/ethnicity, age, gender, education, income, occupation, marital status, drug use, and alcohol use (weekly volume and frequency of heavy drinking). The outcome variable, injury type, was coded as unintentional or intentional based on medical record ICD-9 codes (PI: Caetano, R01 AA013824).

Multivariate logistic regression models were then built using the total scores and subscale scores of each of the main predictors of interest in this study: impulsiveness, alcohol problems, and risk perception. The outcome was injury type (intentional and unintentional injury). Then a model with BIS total and CARE total was built. Finally, a full model was built which included the SIP Plus 6 injury subscale, total score BIS, and total

score CARE, in addition to three interaction terms including: impulsiveness * risk perception, impulsiveness*alcohol problems, risk perception*alcohol problems. Each multivariate model is adjusted for race/ethnicity, age, gender, education, marital status, drug use, and alcohol use. The Hosmer-Lemeshow goodness-of-fit test (Hosmer & Lemeshow, 2000) was run on models containing more than one predictor variable. This statistic provides information on how well each of the models explains the outcome, or in this case, how well the model explains intentional injury. In addition to Wald tests, likelihood ratio tests were also carried out to determine significance of each predictor variable to models.

Inclusion of education, income, and occupation as confounders to be controlled for may cause collinearity, which could result in a loss of power and difficulty in interpretation of results. In order to address this dilemma only one of the variables, education, was controlled for in the multivariate analyses. Education was chosen because it accounted for larger changes in the measures of effect in comparison to income, occupation, and the various combinations of each of these variables. In addition, the only statistically significant contributing variable, according to likelihood ratio test, was education. The model used to evaluate these sociodemographic variables contained race/ethnicity, age, gender, marital status, drug use, and alcohol use.

4. Results

Between May 2003 and May 2005, 5731 trauma patients out of 11 419 trauma activations were screened for inclusion in the study at Parkland Hospital in Dallas, Texas. Of those, 2369 screened positive, 1543 agreed to participate, and 1504 enrolled and completed the initial interview (PI: Caetano, R01 AA013824). The current study included

all 1504 participants who completed the initial interview. 1198 (79.7%) had unintentional injuries and 306 (20.3%) had intentional injuries. The majority were male (82.4%) and White (44.7%). The mean age of participants was 33 years (Standard deviation [SD] = 11.3). Nearly 45% of the sample had less than $20 000 annual household income, and only 26.5% of the sample had schooling beyond high school. 45.6% of the sample reported drug use within the past twelve months. Average weekly volume of alcohol use was 8.8 (SD = 13.8) ounces of ethanol, which translates to 14.6 drinks per week.

A greater proportion of males (22%) had intentional injuries as compared to females (12.5%). Blacks (29.8%) and Hispanics (26.5%) also had larger proportions of intentional injuries in comparison to Whites (11.3%). 27.3% of those out of work had intentional injuries, which was the largest proportion of intentional injuries within categories of occupation and was followed by unable to work (22.6%) and other (21.4%). See Table 1 for complete characteristics of the study population.

Results from univariate logistic regression analyses showed males had 1.99 (95% CI 1.35-2.90) times the odds of intentional injuries compared to females. Blacks (OR = 3.33, 95% CI 2.35-4.71) and Hispanics (OR 2.83, 95% CI 2.08-3.84) had greater odds of intentional injury in comparison to Whites. Odds of intentional injury decreased as income and education increased (Table 2). Those out of work (OR = 1.65, 95% CI 1.23-2.21) and single, never married (OR = 1.41, 95% CI 1.04-1.90) had the greatest odds of intentional injury in comparison to those employed for wages and legally married, living with spouse, or living with their partner in a marriage-like relationship, respectively. Odds of intentional injury also increased with drug use (OR = 1.74, 95% CI 1.35-2.24) and increased as

occasions of heavy drinking (5+ per occasion) increased. See Table 2 for complete univariate logistic regression results.

The average impulsiveness total score, risk perception total score, and alcohol problems total scores were 65.50 (SD =11.71), 81.46 (SD = 19.07), and 7.40 (SD = 10.88), respectively, among those with unintentional injuries and 67.76 (SD = 12.35), 80.30 (SD = 19.83), and 9.12 (SD = 13.31) among those with intentional injuries. Despite the consistency with our hypotheses, the differences in these scores produced nearly null effect measures in multivariate models. Impulsiveness (total, motor, non-planning) and alcohol problems (total, physical, interpersonal, social, plus 6) had moderate effects on intentional injury (see Table 2) in univariate analyses, but became null in multivariate analyses (see Table 3).

The effect of impulsiveness (total score and subscales), risk perception (total score and subscales) and alcohol problems (total score and subscales, with the exception of the injury subscale) on intentional injury were all nearly null, after controlling for race/ethnicity, age, gender, education, marital status, drug use, and annual frequency of heavy drinking (See Table 3). The exception, alcohol problems Plus 6 injury subscale, showed a moderate effect on intentional injury (OR = 1.10, 95% CI 1.02-1.18) after adjusting for race/ethnicity, age, gender, education, marital status, drug use, and annual frequency of heavy drinking. The alcohol problems Plus 6 subscale asks about the frequency of behaviors associated with injury within the past 12 months including: driving a motor vehicle after having 3 or more drinks, getting into a physical fight while drinking, being arrested for driving under the influence of alcohol, having trouble with the law (other than driving while intoxicated) because of drinking, being physically hurt, injured, or

burned because of drinking, and injuring someone else while drinking (Patton et al., 1995). The Hosmer-Lemeshow goodness-of-fit test ($\chi^2 = 7.74$, $p = 0.459$) also showed this model, with the alcohol problems injury subscale, was better at predicting injury type than chance alone. Total score, motor, and non-planning impulsiveness and total score, physical, interpersonal, and social impulsiveness showed moderate effects in univariate analyses (Table 2), but these effects disappeared in multivariate analyses (Table 3).

Race/ethnicity showed a large effect on injury type throughout univariate and multivariate analyses. In comparison to Whites, the odds of intentional injury ranged from 2.29-2.47 (95% CI 1.61-3.52) times greater for Hispanics and 3.06-3.54 (95% CI 2.08-5.18) times greater for Blacks in multivariate analyses (See Table 4). The effect estimates for each of the categories of race/ethnicity remained consistent with each of the multivariate logistic regression models which controlled for age, gender, education, marital status, drug use, and alcohol use. Gender, education, and drug use also had moderate effect estimates and were statistically significant contributors in univariate analyses and in each of the multivariate models.

Likelihood ratio tests were performed for each of the multivariate regression models to determine whether the predictor of interest was a statistically significant contributor to the model. A Chi-square distribution table was used to determine p-values. Results from these tests were consistent with Wald p-values given in the SPSS output and with the effect estimates, revealing only race/ethnicity and injury-related alcohol problems as statistically significant predictors of intentional injury.

5. Discussion

The alcohol problems injury subscale was the only subscale that had an effect on intentional injury, after adjusting for race/ethnicity, age, gender, education, marital status, drug use, and annual frequency of heavy drinking. The other subscales, all the total scores, and interaction terms for impulsiveness, risk perception, and alcohol problems had no effect on injury type, both individually and combined. Race/ethnicity had a consistently large effect with each multivariate model. Gender, education, and drug use also showed large effects on intentional injury in both univariate and multivariate analyses (See Table 2 for univariate results). These results expand the injury literature by including injury type in relation to race/ethnicity and the psychological and behavioral characteristics of impulsiveness, risk perception, and alcohol problems.

This study has several strengths. The large sample size allowed for adequate power in the analyses. In addition, the effect estimates produced were generally precise, which are reflected in the confidence intervals reported in Tables 2 and 3. The instruments used to measure impulsiveness, risk perception, and alcohol problems have all been evaluated and shown to have excellent reliability (Barratt, 1993; Fromme et al., 1997; Miller et al., 1995). Finally, the study population is very diverse, with large proportions of each race/ethnicity group and also included Spanish-speakers. This diversity allows the results to be generalized to each of those groups, which are prominent in both Texas and the United States as a whole.

This study also had several limitations. One potential limitation to the interpretation of data is non-differential misclassification of injury type. Some of the injuries classified as intentional may have actually been unintentional and vice versa. For example, all gun shot

wounds are categorized as intentional injuries, even if the gun shot wound was accidental or unintentional. This is largely due to the use of the ICD-9 codes to classify injuries, which do not take intent into account. This may have biased all our effect estimates toward the null. Future studies or post hoc analyses could narrow the scope of injuries included to motor vehicle collisions (MVC) and assaults and examine police reports or ask intent-related questions in order to examine a more clearly defined dichotomy between non-violence and violence-related injury types. Mello et al. (2005) took a slightly different approach and categorized patients as either MVC or non-MVC injuries and found that brief intervention was more effective in prevention of injuries for the MVC group in comparison to the non-MVC injury patients who also received brief intervention, which suggests there is a difference between people in regard to injury type (Mello et al., 2005). Reliance on the medical paradigm, is seen throughout injury literature. The null effects found in this study may be explained by the shortcomings of using the medical model to examine effects of psychological and behavioral characteristics.

Other limitations are recall bias and prevarication bias due to the use of self-report measures of many of the variables, including impulsiveness, risk perception and alcohol problems. Prevarication bias happens when a participant intentionally lies. Participants may lie about involvement in risky behaviors and/or report inaccurate data because they can no longer recall the correct answers. Those with intentional injuries may be more likely to have been involved in illegal activities, which they may feel the need to lie about. On the other hand, those with unintentional injuries, especially motor vehicle collision victims who had been drinking, may have also have reason to lie related to criminal activity. It is uncertain in which direction this would bias the effect estimates because people with either

injury type may have reason to lie. It is unlikely these biases had an effect race/ethnicity effect estimates, although they may have skewed our other effect estimates.

Another potential source of error may come from the possibility that a patient was intoxicated at the time of interview. Clinical judgment was used to determine whether a patient was sober and able to complete the interview. This means it was possible that a clinician may have unknowingly interviewed an intoxicated person, although chances of this are thought to be very low. It is unknown what impact intoxication may have had on patients' answers. In addition, the use of alcohol by all of the study participants may have affected their recall of, not only their current injury, but also their memories of events within the previous year that they were questioned about, such as amount of alcohol they consumed. This may result in an underestimation of any or all of the effect measures if the alcohol use caused them to forget or underestimate such things as how much they drank. Again, it is unlikely that this bias played a part in the effect estimates for race/ethnicity.

There may also be a lack of generalizability of results beyond an urban Level 1 Trauma Center catchment area. For example, the results may not be applicable to rural settings. The urban setting and use of a Level 1 trauma center may have increased the number of patients with intentional injuries. This would also lead to a lack of generalizability of the results to the target population of White, Black, and Hispanic trauma patients, who may have had injuries of lower severity. In addition, these results may not be generalizable to those outside the Black, White, and Hispanic racial/ethnic groups who were not included in the study population.

The cross-sectional nature of the initial assessment data used for this study may have introduced protopathic bias. Protopathic bias occurs when the outcome, in this case

traumatic injury, has an effect on the exposures of interest, which would include impulsiveness, risk perception, and alcohol problems. For example, it is possible that a person's report of risk perception may have changed due to their experience of being injured. This bias may also be increased because Parkland is a Level 1 Trauma Center and may receive more severe injuries, which could have a greater impact or change in participants' reports on the predictors of interest in this study (i.e. impulsiveness, risk perception, alcohol problems). This bias has the potential to underestimate all of our effect estimates, with the exception of race/ethnicity.

Self-selection bias may have been introduced due to the sensitive nature of the questions patients were asked. For example, many of the questions involved report of illegal behaviors or activities (e.g. use of illegal drugs, alcohol use while driving). Those involved in illegal activities may have decided not to participate. This would likely bias all the odds ratios toward the null. For example, criminals tend to score higher on impulsiveness and they may be underrepresented in this study population (Patton et al., 1995).

Finally, the results are limited by the lack of proven criterion validity of the three psychometric instruments (i.e. BIS-11, CARE, and SIP) used in this study. There are no gold standards or definitive tests in this field to determine a person's level of impulsiveness, risk perception, or alcohol problems. This means there is a chance that impulsiveness, risk perception, and alcohol problems were not truly measured by the instruments used in this study. This limitation would lead to a bias toward the null value of the effect estimates for impulsiveness, risk perception, and alcohol problems. Despite these

limitations, these instruments are well known and widely used in this field in order to measure these psychological constructs.

Future research should consider comparing previous injury type to current injury type in those who have been previously injured may help to explain the results of this study by determining if people with intentional injuries also had previous intentional injuries or if their previous injuries were not consistent in type. In addition, the large effect of race/ethnicity on injury type merits the examination of race/ethnic specific models to examine the effect of impulsiveness, risk perception, and alcohol problems within each race/ethnicity group.

6. Conclusion

This study did not provide evidence for effects of risk perception, impulsiveness, alcohol problems, and interactions of these variables on alcohol-related injury type after adjusting for demographic variables, with the exception of the injury-related alcohol problems subscale, which showed a moderate effect. On the other hand, race/ethnicity showed a large effect on injury type. Overall, those with unintentional and intentional alcohol-related traumatic injuries do not differ in terms of risk perception, impulsiveness, and alcohol problems (except injury-related), but do differ in regard to race/ethnicity and injury-related alcohol problems. Although this study failed to show a relationship between impulsiveness, risk perception, alcohol problems (except injury-related) and injury type, these results support the need for future studies to reevaluate the reliance on medical diagnoses in defining injury type and the need to conduct future studies using a behavioral approach to injury type classification. The large effect of race/ethnicity on intentional

injury supports the creation of interventions for intentional injuries that target Blacks and Hispanics.

Acknowledgements

The data used in this study comes from the University of Texas Houston Dallas Regional Campus MARIA Project, which is funded by the NIAAA. The authors would like to thank the MARIA Project research team and everyone who contributed to this research project.

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Table 1: Characteristics of trauma patients recruited from Parkland Hospital's Emergency Department and enrolled in the Multidisciplinary Approach to Reduce Alcohol and Injury (MARIA) Project (Dallas, Texas, 2003-2005).

Characteristic	No. in sample (n= 1504)	% of all injuries	% with intentional injury	p-value
Age				0.037*
18-24	441	29.3%	23.4%	
25-34	441	29.3%	21.8%	
35-44	346	23.0%	19.1%	
45+	276	18.4%	14.9%	
Gender				<0.001*
Male	1239	82.4%	22.0%	
Female	265	17.6%	12.5%	
Race/Ethnicity				<0.001*
White	672	44.7%	11.3%	
Black	292	19.4%	29.8%	
Hispanic	540	35.9%	26.5%	
Income				<0.001*
Less than $20,000	676	44.9%	24.7%	
$20,001 to $40,000	395	26.3%	18.7%	
$40,001 to $75,000	189	12.6%	15.9%	
$75,001 or more	106	7.0%	6.6%	
Refused	26	1.7%	15.4%	
Do not know	112	7.4%	21.4%	
Education				<0.001*
Some high school or less	581	38.6%	25.3%	
High school diploma or GED	525	34.9%	23.2%	
More than high school	398	26.5%	9.3%	
Occupation				0.009*
Employed for wages	1042	69.3%	18.5%	
Out of work	319	21.2%	27.3%	
Homemaker	46	3.1%	19.6%	
Student	15	1.0%	0.0%	
Retired	14	0.9%	7.1%	
Unable to work	53	3.5%	22.6%	
Other	14	0.9%	21.4%	
Marital Status				0.069*
Single, never been married	677	45.0%	23.6%	
Legally married, living with spouse or living with partner in a marriage-like relationship	432	28.7%	18.1%	
Married, not living with spouse or separated	145	9.6%	16.6%	
Divorced	229	15.2%	18.3%	
Widowed	18	1.2%	11.1%	
Drug use (past 12 months)				<0.001*
Yes	686	45.6%	25.2%	
No	818	54.4%	16.3%	
Alcohol use				
**Weekly volume (ounces of ethanol)	8.8 (13.8)		10.1 (15.0)	0.068^
Frequency of heavy drinking (5+ per occasion, past 12 months)				0.051*
≥ 3 times per week	282	18.8%	23.40%	
1-2 times per week	333	22.1%	23.70%	
2-3 times per month	260	17.3%	20.80%	
1 time per month	183	12.2%	20.80%	
< 12 times per year	436	29.0%	15.80%	
Impulsiveness (BIS-11)				
**Total Score	66.0(11.9)		67.8(12.3)	0.004^
**Cognitive	17.0(4.1)		17.2(4.2)	0.286^
**Motor	24.2(5.2)		24.8(5.7)	0.014^
**Non-planning	24.8(5.3)		25.5(5.5)	0.015^
Risk Perception (CARE)				
**Total Score	81.2(19.2)		80.3(19.8)	0.35^
**Illicit Drug Use	15.9(5.1)		15.5(5.1)	0.117^
**Aggressive and Illegal Behaviors	49.3 (11.8)		48.8(12.6)	0.375^
**Heavy Drinking	16.0 (4.6)		15.9(4.6)	0.927^
Alcohol Problems Recent, past 12 months (SIP Plus 6)				
**Total Score with Plus 6	7.7(11.4)		9.1(13.3)	0.023^
**Physical	1.3(2.3)		1.6(2.6)	0.020^
**Interpersonal	0.9(2.0)		1.1(2.4)	0.029^
**Intrapersonal	1.5(2.7)		1.7(3.0)	0.092^
**Impulse Control	1.2(1.9)		1.3(2.1)	0.341^
**Social Responsibility	1.3(2.5)		1.6(2.9)	0.027^
**Plus 6 (Injury)	1.5(1.9)		1.8(2.2)	<0.001^
Injury Type				---
Unintentional	1198	79.7%	---	
Intentional	306	20.3%	---	

*Chi-square test p-value.
**Mean (Standard deviation)
^ F-test p-value

Table 2: Crude odds ratios and 95% confidence intervals of intentional injury of trauma patients recruited from Parkland Hospital's Emergency Department and enrolled in the Multidisciplinary Approach to Reduce Alcohol and Injury (MARIA) Project (Dallas, Texas, 2003-2005).

Risk Factor	OR	95% CI
Age		
18-24	1.75*	(1.17-2.60)
25-34	1.60*	(1.07-2.38)
35-44	1.35	(0.88-2.07)
45+	1.00	—
Gender		
Male	1.99*	(1.35-2.93)
Female	1.00	—
Race/Ethnicity		
White	1.00	—
Black	3.33*	(2.35-4.71)
Hispanic	2.83*	(2.08-3.84)
Income		
Less than $20,000	4.64*	(2.11-10.19)
$20,001 to $40,000	3.26*	(1.46-7.31)
$40,001 to $75,000	2.67*	(1.59-9.39)
$75,001 or more	1.00	—
Refused	2.57	(0.69-9.55)
Do not know	3.86*	(1.59-9.39)
Education		
Some high school or less	3.31*	(2.25-4.86)
High school diploma or GED	2.95*	(1.99-4.38)
More than high school	1.00	—
Occupation		
Employed for wages	1.00	—
Out of work	1.65*	(1.23-2.21)
Homemaker	1.07	(0.51-2.25)
Student	0.00	—
Retired	0.34	(0.04-2.60)
Unable to work	1.29	(0.66-2.50)
Other	1.20	(0.33-4.34)
Marital Status		
Single, never been married	1.41*	(1.04-1.90)
Legally married, living with spouse or living with partner in a marriage-like relationship	1.00	—
Married, not living with spouse or separated	0.90	(0.55-1.49)
Divorced	1.02	(0.67-1.54)
Widowed	0.57	(0.13-2.52)
Drug use (past 12 months)		
Yes	1.74*	(1.35-2.24)
No	1.00	—
Alcohol use		
Weekly volume (ounces of ethanol)	1.01	(1.00-1.02)
Frequency of heavy drinking (5+ per occasion, past 12 months)		
≥ 3 times per week	1.63*	(1.12-2.37)
1-2 times per week	1.65*	(1.15-2.37)
2-3 times per month	1.39	(0.94-2.07)
1 time per month	1.39	(0.90-2.17)
< 12 times per year	1.00	—
Impulsiveness (BIS-11)		
Total Score	1.02*	(1.01-1.03)
Cognitive	1.02	(0.99-1.05)
Motor	1.03*	(1.01-1.06)
Non-planning	1.03*	(1.01-1.06)
Risk Perception (CARE)		
Total Score	1.00	(0.99-1.00)
Illicit Drug Use	0.98	(0.96-1.01)
Aggressive and Illegal Behaviors	1.00	(0.99-1.01)
Heavy Drinking	1.00	(0.97-1.03)
Alcohol Problems Recent, past 12 months (SIP Plus 6)		
Total Score with Plus 6	1.01*	(1.00-1.02)
Physical	1.06*	(1.01-1.12)
Interpersonal	1.07*	(1.01-1.13)
Intrapersonal	1.04	(0.99-1.09)
Impulse Control	1.03	(0.97-1.10)
Social Responsibility	1.05*	(1.01-1.10)
Plus 6 (Injury)	1.12*	(1.05-1.19)

* $p < 0.05$

Table 3. Multivariate logistic regression models for the relationship between impulsiveness, alcohol problems, risk perception and intentional injury. Data drawn from the MARIA Project, Dallas, Texas, 2003-2005.

	Models 1-15		Model 16		Model 17		Model 18	
Variable	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Impulsiveness (BIS^)								
Total Score	1.01	(1.00-1.02)	1.01	(1.00-1.02)	1.010	(1.00-1.02)	1.00	(0.94-1.06)
Cognitive	1.00	(0.96-1.03)						
Motor	1.02	(1.00-1.05)						
Non-Planning	1.02	(0.99-1.04)						
Alcohol Problems (SIP^^)								
Total Score with Plus 6	1.01	(1.00-1.02)						
Physical	1.05	(0.99-1.12)						
Interpersonal	1.04	(0.98-1.12)						
Intrapersonal	1.02	(0.97-1.07)						
Impulse Control	0.99	(0.92-1.07)						
Social Responsibility	1.02	(0.96-1.08)						
Plus 6 (Injury-related problems)	1.10*	(1.02-1.18)			1.09*	(1.01-1.78)	1.05	(0.63-1.72)
Risk Perception (CARE^^^)								
Total Score	1.00	(0.99-1.01)	1.00	(0.99-1.01)	1.000	(1.00-1.01)	0.99	(0.95-1.04)
Illicit Drug Use	0.99	(0.97-1.02)						
Aggressive and Illegal Behaviors	1.00	(0.99-1.01)						
Heavy Drinking	1.00	(0.97-1.03)						
Interaction Terms								
BIS Total * CARE Total							1.00	(1.00-1.00)
BIS Total * SIP Recent Plus 6							1.00	(1.00-1.01)
CARE Toal * SIP Recent Plus 6							1.00	(1.00-1.00)

^Barratt Impulsiveness Scale

^^ Short Inventory of Problems

^^^ Cognitive Appraisal of Risky Events

* $p < 0.05$

Notes:

Model 1: BIS Total, race/ethnicity, age, gender, education, marital status, drug use, and alcohol use.

Model 2: BIS Cognitive, race/ethnicity, age, gender, education, marital status, drug use, and alcohol use.

Model 3: BIS Motor, race/ethnicity, age, gender, education, marital status, drug use, and alcohol use.

Model 4: BIS Non-planning, race/ethnicity, age, gender, education, marital status, drug use, and alcohol use.

Model 5: SIP Total, race/ethnicity, age, gender, education, marital status, drug use, and alcohol use.

Model 6: SIP Physical, race/ethnicity, age, gender, education, marital status, drug use, and alcohol use.

Model 7: SIP Interpersonal, race/ethnicity, age, gender, education, marital status, drug use, and alcohol use.

Model 8: SIP Intrapersonal, race/ethnicity, age, gender, education, marital status, drug use, and alcohol use.

Model 9: SIP Impulse Control, race/ethnicity, age, gender, education, marital status, drug use, and alcohol use.

Model 10: SIP Social Responsibility, race/ethnicity, age, gender, education, marital status, drug use, and alcohol use.

Model 11: SIP Plus 6, race/ethnicity, age, gender, education, marital status, drug use, and alcohol use.

Model 12: CARE Total, race/ethnicity, age, gender, education, marital status, drug use, and alcohol use.

Model 13: CARE Illicit Drug Use, race/ethnicity, age, gender, education, marital status, drug use, and alcohol use.

Model 14: CARE Aggressive and Illegal Behaviors, race/ethnicity, age, gender, education, marital status, drug use, and alcohol use.

Model 15: CARE Heavy Drinking, race/ethnicity, age, gender, education, marital status, drug use, and alcohol use.

Model 16: BIS Total, CARE Total, race/ethnicity, age, gender, education, marital status, drug use, and alcohol use.

Model 17: BIS Total, CARE Total, SIP Plus 6, race/ethnicity, age, gender, education, marital status, drug use, and alcohol use.

Model 18: BIS Total, CARE Total, SIP Plus 6, all interaction terms, race/ethnicity, age, gender, education, marital status, drug use, and alcohol use.

Table 4. Effect estimates of race/ethnicity on intentional injury from each multivariate logistic regression model. Referent group: Whites

	Hispanic		Black	
Model	OR	95% CI	OR	95% CI
1	2.33*	(1.64-3.33)	3.06*	(2.11-4.44)
2	2.37*	(1.67-3.37)	3.12*	(2.15-4.52)
3	2.43*	(1.71-3.45)	3.13*	(2.17-4.53)
4	2.30*	(1.62-3.27)	3.17*	(2.20-4.58)
5	2.36*	(1.66-3.37)	3.29*	(2.26-4.79)
6	2.29*	(1.61-3.25)	3.29*	(2.27-4.76)
7	2.33*	(1.64-3.31)	3.21*	(2.22-4.65)
8	2.41*	(1.70-3.41)	3.25*	(2.25-4.71)
9	2.45*	(1.72-3.48)	3.23*	(2.22-4.70)
10	2.39*	(1.68-3.39)	3.29*	(2.27-4.76)
11	2.47*	(1.73-3.52)	3.54*	(2.42-5.18)
12	2.37*	(1.68-3.36)	3.16*	(2.19-4.56)
13	2.39*	(1.68-3.38)	3.18*	(2.20-4.59)
14	2.38*	(1.68-3.36)	3.19*	(2.21-4.60)
15	2.37*	(1.67-3.36)	3.19*	(2.21-4.61)
16	2.32*	(1.63-3.32)	3.02*	(2.08-4.38)
17	2.41*	(1.67-3.47)	3.35*	(2.28-4.93)
18	2.40*	(1.66-3.47)	3.35*	(2.28-4.93)

*$p<0.001$

Note: Refer to Table 3 for content of each model.

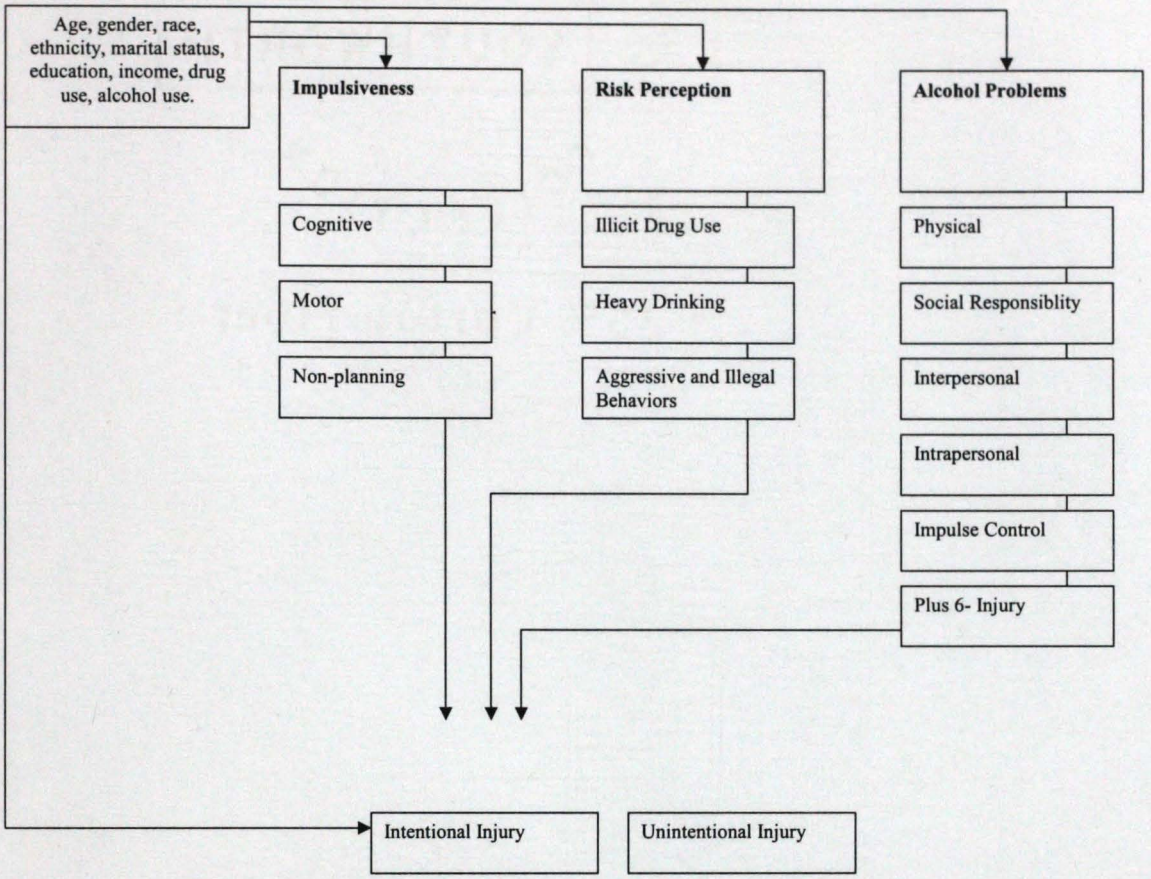

Figure 1. Hypothesized Causal Mechanism of Impulsiveness, Risk Perception, Alcohol Problems and Injury Type.