



Short communication

The role of restraint omission in alcohol-related traffic fatalities



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ABSTRACT

Background and aims: Fatal traffic accidents affect thousands of people in the US alone every year. Alcohol consumption has been identified as a strong predictor of traffic fatalities. This result is hardly surprising as drivers who decide to consume alcohol and then drive are more likely to exhibit poor driving performance. In this paper, I argue that alcohol consumption can lead to traffic fatalities by increasing restraint omission.

Methods: I analyzed individual-level data about victims ($n = 488,829$) of fatal traffic accidents that occurred in the US between January 1, 1999 and December 31, 2015 from the Fatality Analysis Reporting System of the National Highway Traffic and Safety Administration.

Results: There is a strong relationship between alcohol consumption and restraint use. Both vehicle drivers and occupants are far less likely to be restrained when inebriated. Additional analyses show that part of the effect of alcohol consumption on traffic fatalities can be attributed to restraint omission.

Conclusions: There is a significant relationship between alcohol consumption and restraint omission for both drivers and occupants of vehicles that were involved in fatal traffic accidents in the US between January 1999 and December 2015. Past public health campaigns have focused on preventing traffic fatalities by persuading drivers to refrain from getting behind the wheel after consuming alcohol. My data suggest that public health campaigns should inform both drivers and occupants of vehicles about the relationship between alcohol and restraint omission in order to minimize future casualties.

1. Introduction

According to data by the [Fatality Analysis Reporting System \(FARS\)](#) of the [National Highway Traffic Safety Administration \(NHTSA\)](#), 35,092 people were killed in traffic accidents in 2015, an average of 96 people per day. The prevalent belief is that alcohol is often responsible for traffic fatalities because drivers who consume alcohol and then drive are more likely to exhibit impaired driving performance ([Arnedt et al., 2000](#); [Dawson and Reid, 1997](#); [Weiler et al., 2000](#)). In turn, inebriated drivers are more likely to be injured in car crashes ([Connor et al., 2004](#)). In line with this belief, to this day, public health campaigns have focused on preventing alcohol-related traffic fatalities by persuading individuals either to refrain from drinking and driving or to try to prevent others from drinking and driving. Academic research shows that drunk driving campaigns are usually effective in reducing instances of driving under influence, as well as alcohol-related car crashes ([Elder et al., 2004](#)). For instance, according to FARS data, the number of inebriated drivers involved in fatal traffic accidents has decreased from 9,378 in 1999 to 7,584 in 2015. Nonetheless, developing a deeper understanding of the relationship between alcohol consumption and traffic fatalities is warranted in order to minimize future casualties.

While the adverse effect of alcohol consumption on driving

performance is indisputable, in this paper I argue that the relationship between alcohol and traffic fatalities is more nuanced than previously thought. My main proposition is that alcohol consumption may be associated with increased risk-taking behavior, as evidenced by lower restraint use rates (e.g., use of car seatbelts, motorcycle helmets) among both drivers and occupants of vehicles. Therefore, a proportion of alcohol-related traffic fatalities may be attributed to restraint omission.

Prior academic research supports the conjecture that alcohol consumption can increase risk-taking behavior. Lab studies have shown that experimental manipulations of alcohol consumption increase people's propensity to seek risky monetary gains ([Lane et al., 2004](#)), as well as their willingness to enter high-risk situations during a driving simulation ([Burian et al., 2002](#)). Alcohol consumption can increase risk-taking behavior because it reduces people's expectations about potential negative outcomes ([Fromme et al., 1997](#)). Further, alcohol consumption has been shown to have a detrimental effect on people's attentional processing of threat-related cues ([Curtin et al., 2001](#)). In turn, impairments in attention to the threat cue can inhibit subsequent fear response. Finally, alcohol consumption inflates positive self-perceptions and increases overconfidence ([Schweitzer and Gombert, 2001](#); [Schweitzer and Kerr, 2000](#); [Steele and Josephs, 1990](#)). Research in social psychology shows that overconfident individuals tend to feel that

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they are less likely to experience unfortunate events relative to the average person (Chambers and Windschitl, 2004).

Therefore, based on the aforementioned research, assuming that alcohol consumption reduces people's expectations about potential negative outcomes (such as a potential traffic accident), I hypothesized that both the driver and occupants of a vehicle will be less likely to be restrained after consuming alcohol. Note that earlier research has found preliminary support for this hypothesis; Foss, Beirness, and Sprattler (1994) report that drunk drivers in Minnesota were substantially less likely to be wearing a seat belt. Building on those findings, I examined the relationship between alcohol consumption and restraint use by both the driver and occupants of motor vehicles that were involved in fatal traffic accidents.

2. Method

I empirically tested my hypothesis in a large dataset of fatal traffic accidents that occurred in the US between January 1, 1999 and December 31, 2015. I derived individual-level data about victims of fatal traffic accidents from the FARS of the NHTSA. FARS is a census of fatal motor vehicle crashes with a set of data files documenting all qualifying fatalities that occurred within the US. To qualify as a FARS case, the crash had to involve a motor vehicle traveling on a trafficway open to the public, and must have resulted in the death of a motorist or a non-motorist within 30 days of the crash. The dataset comprised the following variables: age, race, and type (i.e., driver, occupant, or other) of the person, as well as whether the person was using a restraint (i.e., seat belt or helmet), whether the person was tested for alcohol (including the result of the test), whether the person was ejected from the vehicle, whether the person was killed, the location of a non-motorist (if applicable), and the year of the incident. Information about both restraint use and the results of an alcohol test was available for 488,829 individuals (see Table 1 for descriptive statistics and Table S1 in supplementary materials for correlations).

3. Results

3.1. Alcohol consumption and restraint use

I analyzed the data through a binary logistic regression because the dependent variable is binary. I regressed (see Model 1 in Tables 2A and 2B) whether the individual was using a restraint (1 = yes, 0 = no) on the result of his or her alcohol test (1 = positive, 0 = negative) while controlling for the age, race, and type of the victim and found a significant effect of alcohol consumption, $\text{Exp}(B) = 0.332$, 95% LLCI = 0.328, ULCI = 0.337 ($B = -1.102$, $SE = 0.007$, $\chi^2 = 25,310.245$, $p < 0.001$). While the majority of victims that tested negative for alcohol were using a restraint (59.6%), less than a third of the victims that tested positive were restrained (32%). Note that the relationship between alcohol and restraint use is significant for both drivers and occupants of the vehicle and for each year in the dataset.

3.2. The indirect effect of alcohol on traffic fatalities through restraint omission

I further tested whether restraint use mediated the effect of alcohol consumption on the victim's probability of dying by estimating a mediation z-test that combines results from two logistic regressions (i.e., in cases where both the mediator and the dependent variable are dichotomous; see Iacobucci, 2012). First, I estimated the path from the independent variable to the mediator (typically referred to as "path a" in mediation analysis): I found a significant effect of alcohol consumption on restraint use, $a = -1.139$, $SE = 0.006$, $\chi^2 = 33,289.302$, $p < 0.001$. Second, I estimated the path from the mediator to the dependent variable while controlling for the effect of the independent

Table 1
Descriptive statistics of sample (N = 488,829).

Alcohol Test	
Negative	309,017 (63.2%)
Positive	179,812 (36.8%)
Restraint Use	
Used	241,653 (49.4%)
Omitted	247,176 (50.6%)
Crash Outcome	
Survived	122,730 (25.1%)
Died	366,099 (74.9%)
Age	
< 20	58,779 (12%)
20–29	124,994 (25.6%)
30–39	84,389 (17.3%)
40–49	81,422 (16.7%)
50–59	62,975 (12.9%)
> 59	75,761 (15.5%)
N/A	509 (0.1%)
Race	
White	228,219 (46.7%)
Black	36,376 (7.4%)
Hispanic	40,564 (8.3%)
American Indian	5611 (1.1%)
Asian	4425 (0.9%)
Pacific Islander	571 (0.1%)
Mixed	518 (0.1%)
Other	15,194 (3.1%)
Unknown or N/A	157,351 (32.2%)
Type	
Driver	395,083 (80.8%)
Occupant	55,214 (11.3%)
Other or N/A	38,532 (7.9%)

Note: Race is coded only for fatalities.

variable (typically referred to as "path b" in mediation analysis): I found a significant effect of restraint use on the victim's probability of dying controlling for alcohol consumption, $b = -1.521$, $SE = 0.008$, $\chi^2 = 38,676.281$, $p < 0.001$. Using the parameter estimates and their standard errors, I estimated the mediation z-test (Iacobucci, 2012), and found that the effect of alcohol on the victim's probability of dying was significantly mediated by restraint use, $Z_{\text{Mediation}} = 134.33$, $p < 0.001$. Interestingly, my analysis shows that restraint use accounts for 67.13% of the effect of alcohol consumption on traffic fatalities. This result suggests that a considerable proportion of traffic fatalities attributed to alcohol consumption occur because inebriated victims are less likely to be restrained. However, note that, to the extent that restraint use and driving performance are correlated, this estimation may be inflated. The lack of a driving performance measure precludes the possibility to estimate the unique contribution of alcohol to traffic fatalities through restraint omission.

3.3. Moderators

I further examined whether the magnitude of the effect of alcohol on restraint use is contingent on characteristics of the victim by adding interaction terms between alcohol and group dummies for the victim's race, age, and type (see Model 2 in Tables 2A and 2B). While I did not hypothesize that victim characteristics would moderate my basic effect prior to data collection, earlier research can inspire the prediction that race and age may influence the effect of alcohol on restraint omission. First, with respect to race, binge drinking is more prevalent among American Indians relative to Whites, Hispanics, and Blacks, whereas Asian Americans are less likely to engage in binge drinking relative to other racial groups (Chartier and Caetano, 2010). Therefore, the relationship between alcohol and restraint omission may be stronger for American Indians and weaker for Asian Americans relative to other

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