The Effects of Alcohol on Drivers

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National Advanced Driving Simulation

Background & Objectives

-Each year, alcohol-related crashes account for 75,000 deaths, which is 31% of all traffic fatalities.
- Alcohol-related crashes not only claim lives, but also cost the United States $132 billion every year.
- It is known that alcohol impairs the driver, however, what is unclear is how driver behavior is affected to produce these impairment performances.
- Therefore, we reanalyzed existing data and examined data from 108 drivers at 3 levels of BAC (blood alcohol concentration).
- The objective of this project is to determine what aspects of driver control are impaired and how this relates to the driver’s blood alcohol concentration.

Method

- Data was collected at the National Advanced Driving Simulator from 108 individuals.
- Each participant drives three times, with BAC levels of 0.00%, 0.05%, and 0.10%.
- Participant’s BAC was raised by having them drink an alcohol-juice mixture.
- NADS-1 was the driving simulator used.
- Vehicle inside the simulator is equipped with cameras and sensors.
- Data recorded includes average speed, lane deviation, and force exerted on accelerator.
- Simulations start with an urban segment through a city, then an interstate segment, and finally rural segment of undivided roads.
- Infrequent lane changes, uncontrolled intersections, and slow-moving trucks make simulation seem real-life.
- Total duration of drive is 30-35 minutes.
- Data is compiled into excel to be analyzed.

Results

- Lane position standard deviation in dark.
- Average speed on interstate.

One case studied was lane deviation of drives in the dark. The minimum deviation was around 0.6, with a BAC of 0.00%. The maximum deviation was around 2.3, with a BAC of 0.1%. By plugging the data point onto an excel sheet by participant and BAC and then graphing it through scatter plot, we were able to determine with certainty that participants with a BAC of 0.00% had the smallest lane deviation. However, the lane deviation of participants with BAC of 0.05% and 0.10% varied from person to person; some people had a higher deviation with a BAC of 0.05%, while others had a higher deviation with BAC of 0.10%.

Conclusion

Multiple cases were studied, and so multiple results were found:

- Participants with a BAC of 0.00% had the lowest lane deviation. However, many participants had a larger lane deviation at 0.05% than 0.10% BAC. Thus we concluded that while alcohol has an effect on lane deviation, the concentration of it does not.
- In another study, we found that a participant’s BAC does not have a profound affect on a person’s average speed. This was not what we had hypothesized to happen.

Implications

Through analysis of the data, we were able to better understand the mechanisms by which driver behavior is affected through alcohol.

Different techniques for alcohol-based sensors in vehicles such as cognitive task batteries, which perform some working memory, tracking, vigilance, and reaction time tasks. By using our information, we can improve these mechanisms and sensors, saving hundreds of lives.

References


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