



# Effects of alcohol on speeding and road positioning among young drivers: *a driving simulator experiment*

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*Washington D.C., January 23<sup>rd</sup>*

# Presentation Outline



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## Subject

1. Alcohol and driving
  2. Experimental Design
  3. Data Analysis and Results
  4. Discussion
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# Alcohol

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- **Alcohol consumption:** annual death of 2.5 million people
    - either from alcohol-related diseases or
    - from accidents related to alcohol-impaired behavior
  - **Alcohol and Driving:**
    - repeatedly linked to high accident rates and severities
    - associated with high external costs (rescue, hospitalization, ...)
    - more dangerous among young people for all BAC ranges
      - increased risk-taking
      - sensation-seeking
      - relative inexperience with drinking, with driving, and
- with combining drinking and driving!**

# Alcohol and Driving

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## ❖ Driving impairment:

- difficulties in perceiving roadway information,
- exacerbating fatigue,
- slower reaction times,
- breaking distances,
- inaccurate steering,
- **speeding and speed variation,**
- **increased lateral position variation**

# Alcohol and Driving

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## ❖ Driving Simulator Experiments:

- few in number despite the obvious potential
- mainly focus on combined effects (drugs, distraction, ...)
- not considered differentiated BAC levels

*however:*

- results can offer (useful) insights!

# Experimental Design

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## ❖ Participants:

- N=49, F(male)=53,1%
- non-abstaining drinkers
- mean age=23.2, SD=2.7

## ❖ Laboratory:

- Department of Transportation Planning and Engineering (NTUA)
- Driving simulator (Foerst F12PT-3L40)
- Breath alcohol test device (Lion SD-400)

# Experimental Design

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## ❖ Procedure:

1. Pilot Session (instruction, equipment)
  2. Baseline driving session (4 minutes)
  3. Questionnaire on alcohol and driving patterns
  4. Alcohol ingestion (100ml of liquor over 10 minutes)
  5. ‘Intoxicated’ driving session (1hour following administration)
- Predefined triggering events allowed for estimating reaction times

# Experimental Design

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## ❖ Performance Measures:

1. Average travelling speed after intoxication
2. Speed variation after intoxication
3. Within-lane position after intoxicated
4. Variation in within-lane position after intoxicated
5. % of driving time when safety distance is kept (after intoxication)
6. Relative difference in time % of safety distance keeping after-before intoxication



# Data Analysis and Results

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## ❖ Dependent Variables:

- **Performance Measures**

## ❖ Modeling approach:

- Multiple linear regression

## ❖ Hypotheses:

- alcohol's driver impairment is directly reflected on reaction time adjustment
- drivers choose travel speed based on reaction times, BrAC, and other personal data
- headway and track are indirectly 'chosen' by drivers with regards to other variables
- alcohol does not have a direct proportional effect on driving impairment; individuals react differently to alcohol in terms of resulting BrAC levels and personal attributes and driving behavior.

## ❖ Regressors:

- Driver attributes
- BAC level
- Other simulator measurements

# Data Analysis and Results



❖ Effect : (+) positive (-) detrimental

Variables	Speeding and speed variation	Road positioning	Safety distance keeping
Regular physical exercise	-	+	
Never drink and drive	-	-	
Previous accident involvement		+	+
BrAC	+	+	
BrAC3/1 values			-
Reaction Time	-	-	-
Self-reported fatigue	+		
Approximated actual fatigue	-	-	
Reported 'excellent' driving skills	+		+
<b>Actual baseline driving performance</b>	<b>+</b>	<b>+</b>	<b>+</b>

# Data Analysis and Results

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## ❖ Major Findings:

- Variables related to weight, age, and sex were not found to be significant
- Significant differentiations across individuals regarding driving performance while intoxicated
- Behavioral patterns regarding drinking, driving, and driving after drinking significantly affect driving performance when intoxicated
- Crucial factor: baseline driving behavioral patterns

# Discussion

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- ✓ Faster alcohol absorption is associated with better driving performance regardless of absolute BrAC level
- ✓ BrAC-speed curve not monotonic over the BrAC intervals considered
- ✓ Driver reaction time while intoxicated: a robust impairment indicator

## Limitations:

- sample size,
- low BrAC levels,
- inherent shortcomings of driving simulators...



Thank you for your attention.