

Low Cortisol Reactivity and Risky Driving Behaviors Under the Influence of Alcohol in Young Drivers

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SAAQ-FRSQ



Presentation plan

- * **Introduction**
- * **Relevance**
- * **Hypothesis**
- * **Methods**
- * **Results**
- * **Discussion**

Introduction

Goal

- * The goal of the current study is to measure the relationship between cortisol reactivity and the presence of risky driving behaviors under the influence of alcohol, in young male drivers, using a driving simulator.

Introduction

Road Traffic Crashes

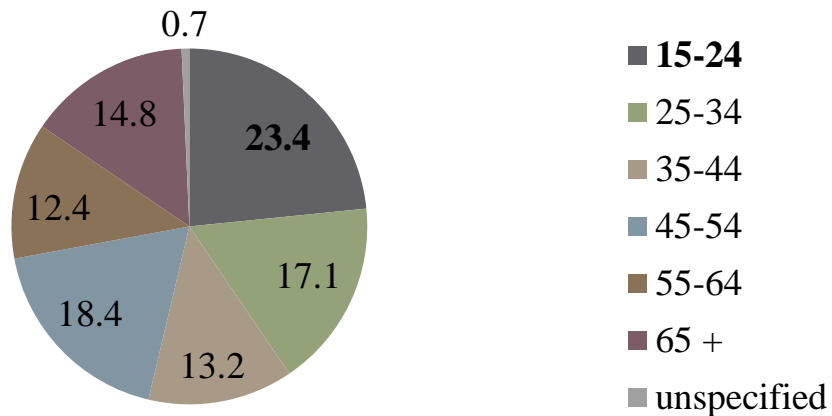


Road Traffic Crashes

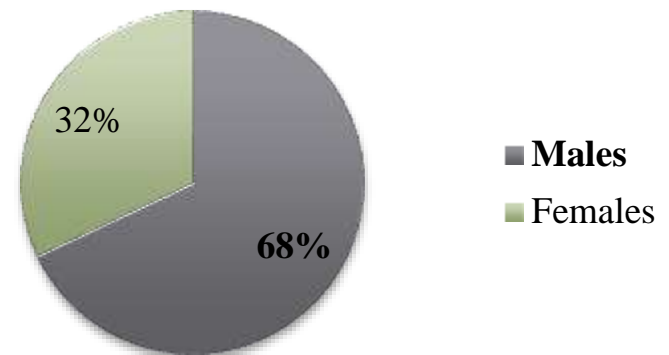
	Injuries/ year	Deaths/ year
Worldwide (2009)	50 million	1,2 million
Canada (2009)	173 000	2 200

* Young male drivers are at high risk of being involved in fatal crashes

Drivers Fatalities in Canada by Age Group (2009)



Road Traffic Fatalities in Canada by Gender (2006)

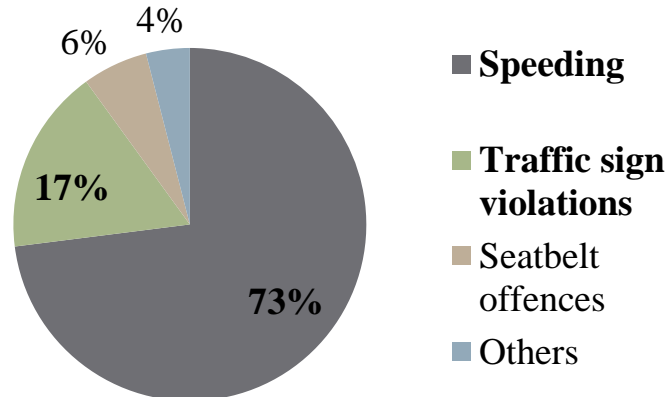


Introduction

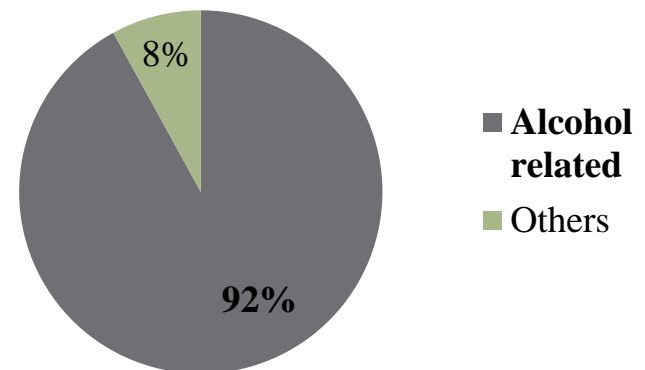
Risky Driving Behaviors

- * Studies observed that road traffic crashes are often preceded by the presence of risky driving behaviors (RDB)
 - * Driving under the influence of alcohol = 30% of fatal crashes
 - * Speeding = 27% of fatal crashes
 - * Traffic sign violations = 12% of fatal crashes

**Highway Safety Code
Infractions by Type**



**Driving Related Criminal
Code Infractions by Type**



Introduction

Factors Associated with Risky Driving Behaviors

Demographic, psychological and substance use factors

- * ♂
- * < 25
- * Sensation seeking
- * Impulsivity
- * Antisocial personality traits
- * Alcohol, cigarette and drug use

Cortisol reactivity and risky driving behaviors : An objective psychobiological risk factor

Definition: Physiological response to stress, variable between individuals, measureable using cortisol, one of the stress axis hormones.

- * Low cortisol reactivity was strongly associated with frequency of past DUI convictions
- * Cortisol reactivity was more strongly associated with passed DUI convictions than other factors
- * Cortisol reactivity was significantly lower in DUI-recidivists compared with non-DUI control group
- * Low cortisol reactivity was associated with higher crash and near-crash rates during the first 18 months of licensure

Relevance

- * The current study aims to expand our knowledge regarding cortisol reactivity and RDB, by observing driving behaviors of young male drivers, under the influence of alcohol, using a driving simulator
- * 1st study to combine cortisol reactivity, driving behaviors and alcohol consumption
- * Driving behaviors observed in the current study are:
 - * Decision to DUI
 - * Speed
 - * Traffic-sign violations

Hypothesis

This study examines the relationship between stress response and RDB under the influence of alcohol in young male drivers. It was hypothesized that low cortisol reactivity is associated with increased RDB under the influence of alcohol in young male drivers.

Methods

Participants and Dependent Variable

Participants

N = 40 healthy male drivers aged 20 - 24 years old and living in greater Montreal

Dependent variable : Risky driving behaviors under the influence of alcohol

(the data for the dependent variable was obtained from a larger study)

- 1) Alcohol consumption
2 doses randomly assigned to the participants (45 g/kg or 65 g/kg)*
- 2) Baseline driving simulation under the influence of alcohol
Score for speed
Score for traffic sign-violations
- 3) Self-assessment of the blood alcohol concentration (BAC)
Participants randomly assigned to use or not a feedback device, programmed to indicate that their BAC was above the legal limit*
- 4) Decision to drive or not a 2nd simulation under the influence of alcohol
Score for decision to DUI



* Alcohol dose and use of feedback device are variables from the larger study that we controlled in the analysis

Methods

Dependent Variable Measurement

Risky Driving Behavior Under the Influence of Alcohol **Speed**

Average speed during the first simulation

+

Traffic sign violation

3 points by infraction for stop signs and traffic light violations during the first simulation

+

Decision to DUI:

15 mins wait and 15 mins ride as a passenger = 0 points

Drive 2 minutes and 15 mins ride as a passenger = 4 points

Drive the entire 2nd simulation (approx. 15 mins) = 15 points

* Higher scores = riskier driving behaviors

Methods

Independent Variable



Independent variable : Cortisol Reactivity

(Cortisol reactivity was measured during a 2nd visit at the lab)

A stress induction task, the *Trier Social Stress Test* was used to measure salivary cortisol reactivity

- 1) 30 minutes of rest
- 2) 10 minute task in front of evaluators combining oral communication and arithmetic task with time constraint
- 3) 60 minutes of rest



8 salivary cortisol samples were obtained at 15 minute intervals before and after the task



Methods

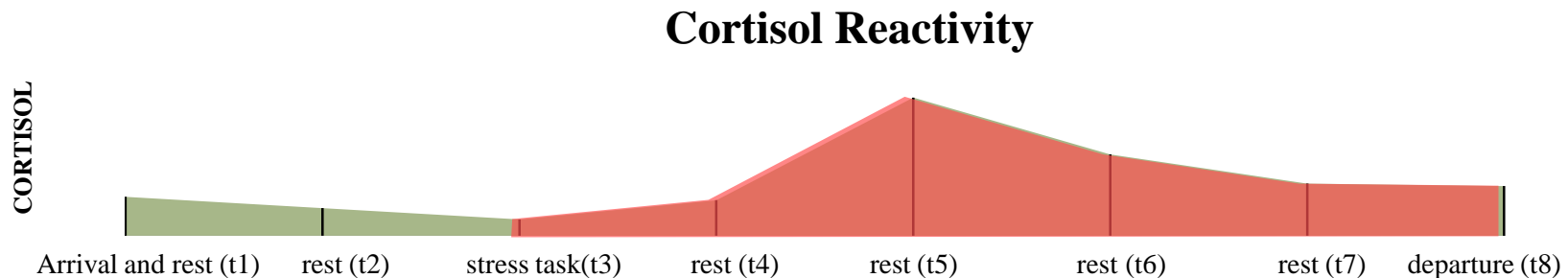
Independent Variable Measurement

Cortisol Reactivity Measure

Area under the curve between t3 and t8

$$\text{AUCg} = ((c4+c3)/2*t3) + ((c5+c4)/2*t4) + ((c6+c5)/2*t5) + ((c7+c6)/2*t6) + ((c8+c7)/2*t7)$$

C = cortisol; T = time interval between 2 samples



Methods

Statistical Analysis

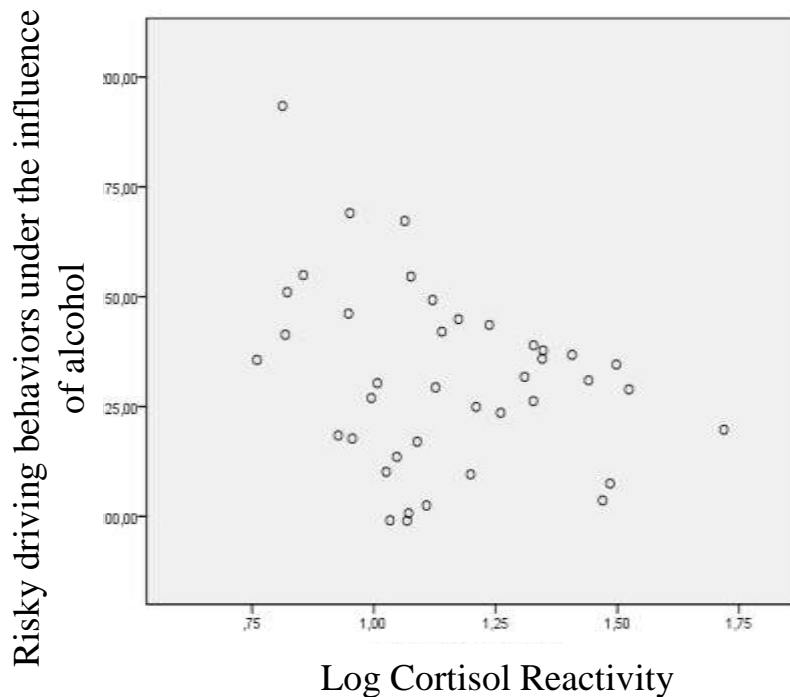
Partial Correlation Analysis

To measure the correlation between cortisol reactivity and the presence of risky driving behaviors after alcohol consumption, while controlling two variables from the larger study that were randomly assigned

Controlled variables

- 1) Alcohol dose
- 2) Use of feedback device

Results



Partial correlation	p	dl	n
-0,341	0,036	36	40

After controlling for 1) alcohol dose and 2) use of feedback device, we found a significant inverse correlation between cortisol reactivity and presence of risky driving behaviors under the influence of alcohol

Discussion

- * Low cortisol reactivity is associated with increased risky driving behaviors under the influence of alcohol
- * Results are congruent with previous studies
 - * Low cortisol associated with frequency of past DUI convictions
 - * Low cortisol associated with higher crash and near-crash rates
- * Cortisol reactivity = Objective psychobiological risk factor associated with different RDB
- * Drivers with low cortisol reactivity (low stress response) may not perceive dangers the same way than other drivers
- * A better understanding of high-risk drivers could enable the development of more personalized intervention tools
 - * E.g., Monitoring risky driving behaviors using in-vehicle feedback technologies
 - * Effective at reducing RDB with young drivers
 - * Future studies could test this intervention with young drivers with low cortisol reactivity



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 - * Auto 21

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Thank you for your attention!

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