

“Texting and Driving Studies in a Simulator: Two Ways to Make a Bad Thing Worse”

Lifesavers Workshop #2
Sunday, March 16; 1:45-3:15 pm

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Collaborators

Study #1 – Age Differences	Study #2 – Beer Goggles
Gordon Rumschlag Theresa Palumbo Amber Martin Doreen Head Rajiv George	Theresa Palumbo Doreen Head Aaron Swift Gordon Rumschlag Jeremy Ing Cindy Ng Matthew Surducan Eric Lahoud Brenna Johnson Benjamin Mackie

Supported in part by a Faculty Research Award, Wayne State University

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Introduction (Disclaimer)

RL Commissaris - Research History in Photos



🌱 Old Research: 1975-present

- Analysis of Drug Effects on Rat Behavior
- Neuroanatomical sites
- Brain receptor mechanisms



🌱 New Research: 2013 - present

- Analysis of Human Behavior – Driving in the Simulator
- Primarily descriptive and not ‘in the weeds’ analytical
- Emphasis on developing problems

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Overall Introduction

- 🌐 Distracted driving is a significant problem;
- 🌐 Texting is an increasingly prevalent and also highly potent form of driver distraction;
- 🌐 Some recent developments in texting that may affect texting and driving
 - Texting is no longer only a young person behavior; texting while driving has been increasing among 'mature' drivers
 - Influence of driver age on texting-related impairment has not been systematically studied
 - Drinking and texting are becoming common behaviors, e.g., mydrunktexts.com; drunktext.com
 - The 'trifecta' of drinking and texting while driving has not been studied

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Two Studies Today

- 🌐 Study #1 – Determine the influence of driver age on texting-related driving impairment;
- 🌐 Study #2 – Determine the influence of visual impairment (Beer Goggles) on texting-related driving impairment;

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Study #1



The effects of texting on driving performance in a driving simulator:
The influence of driver age
Gordon Rumschlag^a, Theresa Palumbo^a, Amber Martin^a, Doreen Head^b, Rajiv George^b,
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Study #1 - Introduction

- 🌟 Distracted driving is a significant problem;
- 🌟 Texting is an increasingly prevalent and also highly potent form of driver distraction and potential driving impairment;
- 🌟 Driver age and experience can be significant factors
 - Mature drivers have been found to be better drivers;
 - Mature drivers have been shown to be less adversely affected by several distractions;
- 🌟 Influence of Driver Age on Texting-related impairment has not been systematically studied

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Studies on the Influence of Driver Age on the Distracting Effects of Texting Driving Simulator Performance Are Lacking

(from Klauer et al. *New England Journal of Medicine*, January, 2014)
 Table 2. Odds Ratio for a Motor Vehicle Crash or Near-Crash Associated With Performance of a Secondary Task.^a

Task	Odds Ratio (95% CI)	
	Novice Drivers	Experienced Drivers
Using cell phone		
Texting or using Internet	5.27 (1.62–17.23)	NA†
Dialing	8.22 (2.83–24.42)	2.49 (1.28–4.54)
Talking	0.61 (0.24–1.57)	0.76 (0.51–1.13)
Reaching for phone	7.05 (2.64–18.83)	1.37 (0.31–6.14)
Reaching for object other than cell phone	8.00 (3.67–17.50)	1.19 (0.61–2.31)
Looking at roadside object	3.90 (1.72–8.81)	0.67 (0.37–1.22)
Adjusting controls for radio or HVAC	1.37 (0.72–2.61)	0.53 (0.30–0.94)
Adjusting controls other than those for radio or HVAC	2.60 (0.89–7.65)	0.64 (0.15–2.85)
Eating	2.99 (1.30–6.91)	1.76 (0.74–2.15)
Drinking nonalcoholic beverage	1.36 (0.31–5.88)	0.44 (0.16–1.22)

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Study #1 - Purpose of the Present Study

- 🌟 The purpose of the present study was to examine the influence of driver age (and other factors) on the impairment of driving simulator performance produced by texting.

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Study #1 - Materials and Methods

- **Subjects**
- **EACPHS Driving Simulator**
- **Experimental Design**
- **Data Collection**
- **Primary Dependent Variables**
- **Statistical Analyses**

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Study #1 - Subjects

- **Unpaid volunteers; N=50; 18-65 years of age**
- **Most were students, faculty or staff at Eugene Applebaum College of Pharmacy and Health Sciences (EACPHS) at Wayne State University; also some willing and interested relatives**
- **Exclusion Criteria**
 - Under the influence of alcohol or drugs
 - If initial test drive resulted in 'simulator sickness'
 - If cell phone service was T-Mobile (dead zone)
- **WSU Behavioral IRB #063413B3X**

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EACPHS Driving Simulator

- **Fixed-base driving simulator – 2001 Chevy Impala (“... Hey, that’s just like my old car...”);**
- **DriveSafety Inc with Hyperdrive software;**
 - 4-screen video projection system
 - 3 screens →150 degree frontal view;
 - Rear projection screen;
 - The ‘road’ was a simple, two-lane road with occasional minor turns; no intersections, no stoplights, no stop signs, no oncoming traffic;
- **The occurrence (or not) of Lane Excursions was the primary measure of interest;**
 - only one component of driving skill and ability

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EACPHS Driving Simulator



Study #1 - Experimental Design

Entire experiment was conducted in a single 30-minute session

- 🔗 Phase 1 – Drive #1; acclimation to the driving experience (55-60 mph; no texting)
- 🔗 Phase 2 – short survey about driving history, texting history, texting skill, subject demographics
- 🔗 Phase 3 – Drive #2; same road (55-60 mph); received and replied to three text messages during the drive;
- 🔗 Phase 4 – post-test survey (3 questions)

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Study #1 - Experimental Design Texting While Driving Specifics

- 🔗 Subjects used their own cell phones
- 🔗 Sample Text Questions (GR/TP)
 - What high school did you graduate from?
 - What sport, if any, did you play in high school?
 - What is your favorite kind of food?
- 🔗 Texts were sent at the same general point on the 'road' for all subjects

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Study #1 - Data Collection

- Driver was watched for texting behavior on video monitor (RLC);
- Activation of 'texting switch' sent signal to Driving Simulator computers
- Data from excel spreadsheets were sorted into bins corresponding to:
 - 10 seconds before texting
 - The period of texting (receiving, thinking, typing, sending)

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Study #1 - Primary Dependent Variable

- Driving Simulator sent information to computers from multiple performance measures (speed, braking, turning, etc)
- Primary Dependent Variable in the present study was: Lane Excursions (Yes/No); Lane Excursions are defined as wandering out of the designated lane;
- Lane Excursions are only one component of overall driving behavior

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Study #1 - Statistical Analyses

- Lane Excursions:
 - Yes/No: Chi Square Analyses
 - Percent of Texting Time Spent in Lane Excursions : ANOVA
- Primary Dependent Variables were sorted and analyzed according to Demographic Factors
 - Driver Gender, Texting History, Texting Skill Level, Driver Age, etc

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Study #1 - Demographic Factors (1 of 2)

- Gender: 27 Female; 23 Male
- Age: Overall average → 34.5 + 11.7 (SD)
 - 18-24 years old (N=12)
 - 25-34 years old (N=16)
 - 35-44 years old (N=9)
 - ≥ 45 years old (N=13)
- Self-Reported Texting Skill:
 - Limited and Slow (N=7)
 - Two hands; Good but not Excellent (N=16)
 - One Hand; Excellent (N=27)

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Study #1 - Demographic Factors (2 of 2)

- Frequency of Normal Texting
 - 6-10 texts/week (N=6)
 - 11-50 texts/week (N=15)
 - 51-500 texts/week (N=22)
 - > 500 texts/week (N=7)
- Do You Think Texting and Driving is Safe?
 - YES (N=0)
 - NO (N=50)

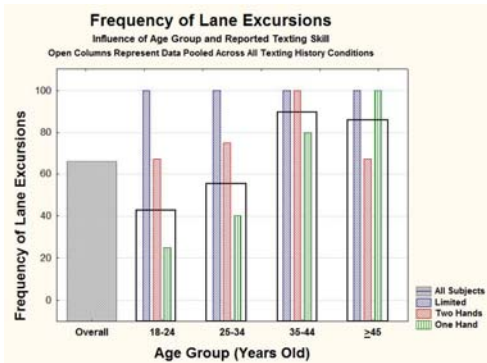
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Study #1 - Results

- Data from All Subjects Across All Conditions (N=50)
- Analysis of Highly-Skilled Texters ONLY
- NO Influence of Driver Gender (data not shown)

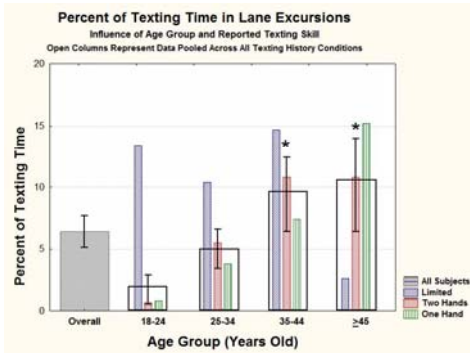
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Results – Frequency of Lane Excursions During Texting Associated with Driver Age Group and Texting Skill Level



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Results - Percent of Texting Time Spent in Lane Excursions associated with Texting While Driving: Influence of Driver Age Group and Texting Skill Level.



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Study #1 - Influence of Driver Age on Texting-Related Driving Impairment

Potential Confounding Factors

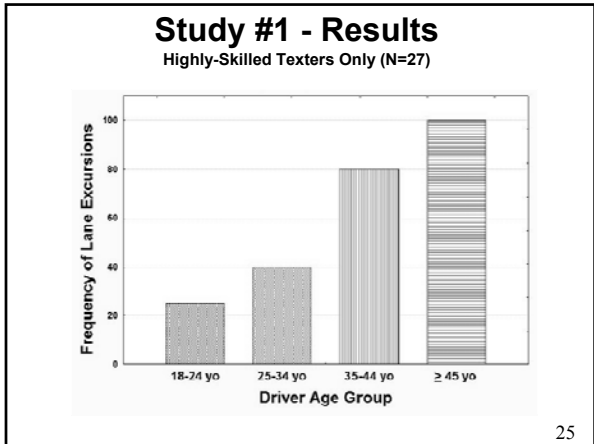
The Problem:

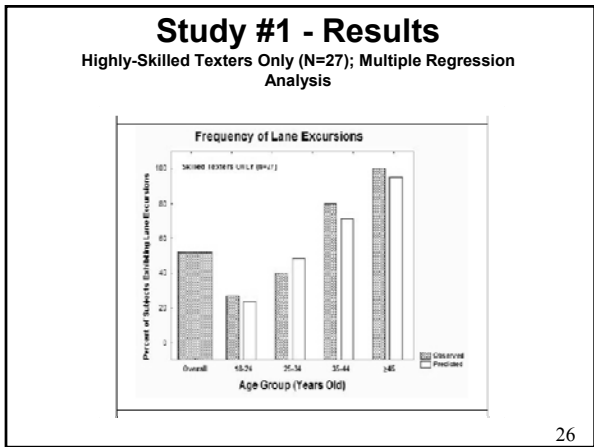
- Texting-Related Driving Impairment correlates with Driver Age, but....
- Text-Related Driving Impairment also correlates with Texting Ability and Texting Frequency

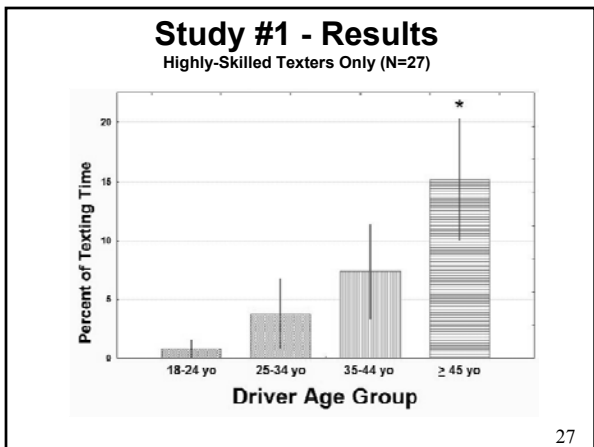
Potential Solutions:

- Multiple Regression Analyses - Driver Age is the most potent influence (data not shown)
- Examination of Data from Highly-Skilled Texters ONLY (N=27)

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Study #1 – Summary

- There were no lane excursions in the absence of texting (data not shown); it's a pretty 'easy' road;
- For ALL Age Groups, texting impaired performance in the Driving Simulator by increasing both the frequency of occurrence and the percent of texting time involved in Lane Excursions;
- The impairing effects of texting were directly correlated with Driver Age; this was true even when ONLY highly-skilled texters were studied.

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Two Studies Today

- Study #1 – Determine the influence of driver age on texting-related driving impairment;
- Study #2 – Determine the influence of visual impairment (Beer Goggles) on texting-related driving impairment;

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Study #2

(Human Factors, submitted)

The Effects of Texting and DUI Simulation on Driving Performance in a Driving Simulator

Theresa J Palumbo¹, Doreen Head², Aaron Swift³, Gordon Rumschlag¹,
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Johnson¹, Benjamin Mackie¹ and Randall L Commissaris¹

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Study #2 - Introduction

- Alcohol is a major cause of traffic fatalities (10,000 deaths/year; 30-35% of total; NHTSA, 2012);
 - Alcohol affects driving in many ways: reaction time, judgement, risk-taking, visual disturbances)
 - Visual disturbances can be simulated using 'Beer Goggles'
- Alcohol intoxication and texting are increasingly more common; e.g., mydrunktexts.com, drunktext.com
 - Leaving the bar, starting the car, and grabbing for the phone: "Hey, dude, where's the party?" is not an uncommon scenario
 - There are no studies on drinking and texting while driving
 - Prediction: drinking makes the effects of texting even worse³¹

Study #2 - Purpose of the Present Study

- The present study used 'Beer Goggles' to test the hypothesis that the visual perception disturbances associated with ethanol intoxication will potentiate the disruptive effects of texting on driving performance.

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Study #1 - Materials and Methods

- Subjects
- EACPHS Driving Simulator
- Experimental Design
- Data Collection
- Primary Dependent Variables
- Statistical Analyses

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Study #2 - Subjects

- 8 females and 8 males; 19-26 years old; paid \$20
- Students and staff at EACPHS;
- Exclusion Criteria
 - Under the influence of alcohol or drugs
 - If initial test drive resulted in 'simulator sickness'
 - If cell phone service was T-Mobile (dead zone)
 - Participation in Study #1
- WSU Behavioral IRB #063413B3X (amended)

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Study #2 - EACPHS Driving Simulator

- The Car – same as in Study #1
- The Controller – same as in Study #1
- The Road
 - Mimicked a NHTSA-approved road for distracted driving testing:
 - Multiple long straight stretches, connected by gentle turns;
 - Pace car (55 mph); no other traffic

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EACPHS Driving Simulator



Study #2 - Experimental Design

Entire experiment was conducted in a single 45-minute session

- Phase 1 – Drive #1; acclimation to the driving experience (55-60 mph; no texting)
- Phase 2 – short survey about driving history, alcohol history, texting history, texting skill, subject demographics
- Phase 3 – Drive #2; same road (55-60 mph); received and replied to four text messages during the drive; two with Beer Goggles, two control;
- Phase 4 – post-test survey

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Study #2 - Experimental Design

Entire experiment was conducted in a single 45-minute session

- Texting while driving: Effect of Beer Goggles**
 - Two texts while wearing laboratory safety goggles (control);
 - Two texts while wearing 'Beer Goggles'; mimicked (0.07 – 0.10% EtOH; legally drunk = 0.08% EtOH)
 - Order of goggle treatment was balanced across subjects;

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Study #2 - Experimental Design Texting While Driving Specifics

- Subjects used their own cell phones
- Sample Text Questions (TP/GR)
 - What high school did you graduate from?
 - What sport, if any, did you play in high school?
 - What is your favorite kind of food?
- Texts were sent when the car was in the middle of a straight stretch of roadway

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Study #2 - Data Collection
Driving Behavior and Eye Glance Behavior

Driving Behavior/Performance

- Software glitch on HyperDrive → car drive data were not saved;
- Videotapes of drives were scored (blinded reviewers) for lane position on 1-4 scale: 1=perfect; 2=deviation, but no excursion; 3=one or more lane excursions; 4=crash would have been virtually certain; multiple trained raters, high correlations between raters;
- Driving performance was scored (1) on straight road immediately before texting (pre-text 10 seconds) and (2) on straight road during texting

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Study #2 - Data Collection
Driving Behavior and Eye Glance Behavior

Eye Glance Behavior

- Videotapes of driver faces were scored (by blinded reviewers) for the duration of eye glances on the road and eye glances on the phone during texting;
 - Total number of eye glances away from the road;
 - Mean (and median) duration of eye glances away from the road;
 - Duration of the Longest Glance Off the Road (LGOR)
 - Duration of Total Time of Eyes Off the Road (TEOR)

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Study #2 - Statistical Analyses

Driving Behavior/Performance:

- 2 x 2 x 2 Factorial ANOVA: Main Effects of Gender (Male/Female), Goggle Condition (Beer/Control) and Texting Condition (Yes/No)

Eye Glance Behavior

- 2 x 2 Factorial ANOVA: Main Effects of Gender (Male/Female) and Goggle Condition (Beer/Control)
- Separate ANOVAs for Different Eye Glance Measures

Multiple Regression Analysis

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Study #2 - Demographic Factors

- Gender: 8 Female; 8 Male
- All 'Young': 22.8 ± 1.8 (Mean \pm SD) years
- All had high-level cell phones
- Self-Reported Texting Skill: High for all subjects
- Texts sent/week $\rightarrow 75.9 \pm 33.5$ (Mean \pm SD)

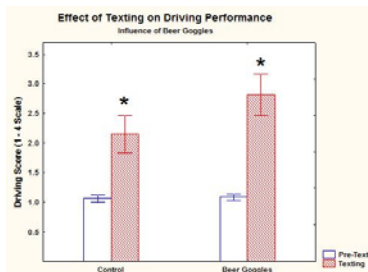
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Study #2 - Results

- Driving Behavior/Performance
 - Beer Goggles Alone
 - Texting Alone
 - Interaction of Beer Goggles and Texting
- Eye Glance Behavior
 - Effects of Texting Alone
 - Effects of Texting with Beer Goggles
- Multiple Regression Analyses

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Study #2 - Results The Effects of Texting on Driving Performance: The Influence of Beer Goggles



Beer Goggles did not affect driving in the absence of texting;

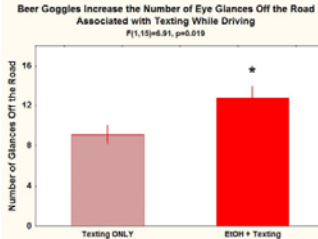
Texting disrupted driving;

Beer Goggles potentiated the effects of texting on driving;

Palumbo et al., submitted

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Study #2 – Results
The Effects of Texting Eye Glance Behavior:
The Influence of Beer Goggles



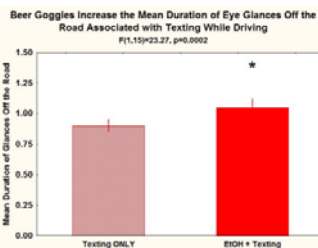
Texting resulted in an average of approximately 9 eye glances off the road during a single text conversation;

Beer Goggles significantly increased the number of eye glances off the road during a single text conversation;

Palumbo et al., submitted

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Study #2 – Results
The Effects of Texting Eye Glance Behavior:
The Influence of Beer Goggles



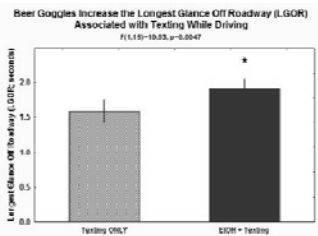
The average duration of eye glances off the road during texting while driving was approximately 0.9 seconds;

Beer Goggles significantly increased the average duration of eye glances off the road during texting while driving;

Palumbo et al., submitted

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Study #2 – Results
The Effects of Texting Eye Glance Behavior:
The Influence of Beer Goggles



The Longest Glance Off the Road (LGOR) during texting while driving was approximately 1.5 seconds in a single text conversation;

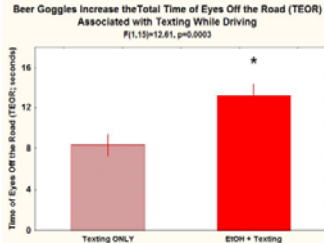
Beer Goggles significantly increased the LGOR in a single text conversation;

Palumbo et al., submitted

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Study #2 – Results

The Effects of Texting Eye Glance Behavior: The Influence of Beer Goggles



The Total time of Eyes Off the Road (TEOR) during texting while driving was approximately 8 seconds in a single text conversation;

Beer Goggles significantly increased the TEOR in a single text conversation;

Palumbo et al., submitted

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Study #2 – Summary

- Beer Goggles did not adversely affect driving before texting; it's a pretty 'easy' road;
- Texting impaired performance in the Driving Simulator; this effect was potentiated by Beer Goggles;
- Texting was associated with significant periods where the eyes were not focused on the road; this effect was potentiated by Beer Goggles;
- Although many measures correlated with texting-related disruption of driving performance, multiple regression analysis revealed no single predictor of this measure.

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Conclusions and Discussion

Public Health Perspective

- **"Don't text while Driving"** messages should be continued; moreover,
 - Study #1: *"Don't text while Driving"* messages should be directed at all driver age groups, not just young drivers;
 - Study #2: *"Don't text while Driving"* messages should be expanded to focus on the negative interaction between texting, drinking and driving;
- **Driving Simulator Experience** may be a useful way to increase awareness of the dangers of texting while driving
 - 60% of our drivers stated that it was WORSE than they had initially thought
 - The challenge is how to spread that message; incorporating Driving Simulator experiences/information into *"Don't Text While Driving"* messages;

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Collaborators

Study #1 – Age Differences	Study #2 – Beer Goggles
Gordon Rumschlag Theresa Palumbo Amber Martin Doreen Head Rajiv George	Theresa Palumbo Doreen Head Aaron Swift Gordon Rumschlag Jeremy Ing Cindy Ng Matthew Surducun Eric Lahoud Brenna Johnson Benjamin Mackie

Supported in part by a Faculty Research Award, Wayne State University

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Thank you.

Questions ?

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Future Studies Drugs, Driving and Texting

- Baseline Driving performance and interactions with the effects of texting will be examined;
- Initial studies are planned to compare the effects of two OTC meds: antihistamine Benadryl, the ‘non-sedating’ antihistamine Claritin, and placebo (no drug);
- Subsequent studies on Rx drugs and drugs of abuse

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Future Studies - Drugs and Driving

- Initial studies are planned to compare the effects of two OTC meds: antihistamine Benadryl, the 'non-sedating' antihistamine Claritin, and placebo (no drug);
- Baseline Driving performance and interactions with the effects of texting will be examined;



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