Towards Mitigating Teenagers’ Distracted Driving Behaviors: A Social Norms Approach

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Motivation

Teen drivers have an elevated crash risk relative to adult drivers (Williams, 2000).

- 5.5% of all licensed drivers in the U.S.
- 9% of the drivers involved in fatal crashes
- 12% of those involved in police-reported crashes (NHTSA, 2014).

Numerous factors contribute to this high crash risk:
- Inexperience, immaturity, risky driving, and driver distraction
Driver Distraction

“The diversion of attention from activities critical for safe driving towards a competing activity”

(Regan, Lee, & Young, 2008)

• 20% of all crashes involving 15-18 year old drivers
  (Curry et al., 2011)

• 10% of fatal crashes among 15-19 year old drivers in the U.S.
  (NHTSA, 2016)
Driver Feedback to Mitigate Distraction

Real-time visual feedback on off-road glances results in a reduction in off-road glance frequency.
(Donmez, Boyle, & Lee, 2007)

Post-drive feedback on distraction level and critical incidents improves driving performance.
(Donmez et al., 2008)
Social Norms

“Rules and standards that are understood by members of a group, and that guide and/or constrain human behavior without the force of laws”

(Cialdini & Trost, 1998)

• Descriptive: what other people commonly do
• Injunctive: what other people commonly approve or disapprove
Social Norms Theory (Berkowitz, 2002)

- Individuals usually overestimate the extent to which others engage in or approve of unhealthy behaviors.
- Individuals use their perceived norm as a point of comparison for their own behavior and a reference point.
- Providing accurate normative information can correct the misperception and reduce the prevalence of unhealthy behavior.
Social Norms Approach

Research continuously reveals their effectiveness.

- Alcohol use
- Smoking
- Energy consumption

(e.g., Haines et al., 2003; Linkenbach & Perkins, 2003; Allcott, 2011)
Objective

Investigate the effectiveness of a social norms based feedback system in mitigating teens’ distracted driving.

• Parental descriptive norms
  • Teens’ perception of parents’ distraction engagement, but not parents’ approval of it, predictive of teens’ engagement (Carter et al., 2014).
Experimental Design

Driving simulator experiment and questionnaire

Mixed factorial design

• Between subjects: Feedback systems (4 conditions)

• Within subjects: 5 drives
  • ~ 6.5 min each
  • Two-lane rural road
  • 8 lead vehicle braking events
Secondary Task

Self-paced visual-manual secondary task (Donmez et al., 2007)
Intervention Systems

Between subjects:

• Post-drive feedback incorporating parental norms (social norms feedback)
• Post-drive feedback without social norms (post-drive feedback)
• Real-time feedback
• No-feedback
Social norms feedback

Drive Summary

# of Unsafe Brakes
- You: 3
- Brake 1: Distraction Detected
- Brake 2:
- Brake 3: Distraction Detected

# of Lane Deviations
- You: 2
- Deviation 1: Distraction Detected
- Deviation 2: Distraction Detected

# of Unsafe Glances
- You: 8
- Parent: 2
- % of Time Not Looking at Road
  - You: 42%
  - Parent: 10%
Post-drive feedback

Real-time feedback
  • Auditory alert, beep sound for 0.5 seconds
Apparatus

- NADS MiniSim™
- FaceLAB™ 5.1
- Surface™ Pro 2
Participants

- 40 teen-parent dyads

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- Recruitment
  - 17 to 19 year old teens
  - Have a G2 or G driver’s license in Ontario
  - Have normal or corrected vision
Analyses

Mixed linear model (PROC MIXED) and Poisson model (PROC GENMOD)

Distraction Engagement Measures:
- Rate of glances over 2 seconds on the secondary display
- % time looking at the secondary display
- Average glance duration
- Number of manual interactions with the secondary task

Driving Performance Measures:
- Standard deviation of lane position
- Brake response time
- Maximum deceleration
- Minimum time to collision
Results

Rate of long glances (>2 seconds) per minute

[Box plots showing the distribution of long glances for different conditions: No-feedback, Social-norms, post-drive, and real-time.]
Results

Rate of long glances (>2 seconds) per minute
Results

Average glance duration on secondary display (ms)
Results

Average glance duration on secondary display (ms)
Results

Distraction Engagement

• Social norms and real-time feedback were effective: *smaller rate of long glances and average glance duration*
• Effects of social norms feedback were stronger and emerged sooner.
• Real-time feedback mitigated distraction through mainly limiting glance durations.
• Social norms feedback decreased engagement in the secondary task: *decreased number of manual interaction*
• No effect was observed for post-drive feedback.
Results

Driving Performance

• Social norms and real-time feedback improved driving performance: *smaller standard deviation of lane position and maximum deceleration*

• Effects of social norms feedback was stronger particularly for lead vehicle braking event response: *shorter brake response time*

• No major effect was observed for post-drive feedback.
Limitations and Conclusions

• Sample was limited to teens and parents who were willing to participate in the study.

• The use of artificial data is a limitation.

• Feedback systems based on social norms are promising for mitigating distraction among teens.
  • Effects can be either due to providing parental norms information or a reference point.

• Lack of benefits for post-drive feedback might be due to the characteristics of feedback tested in this study.
Acknowledgments