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"
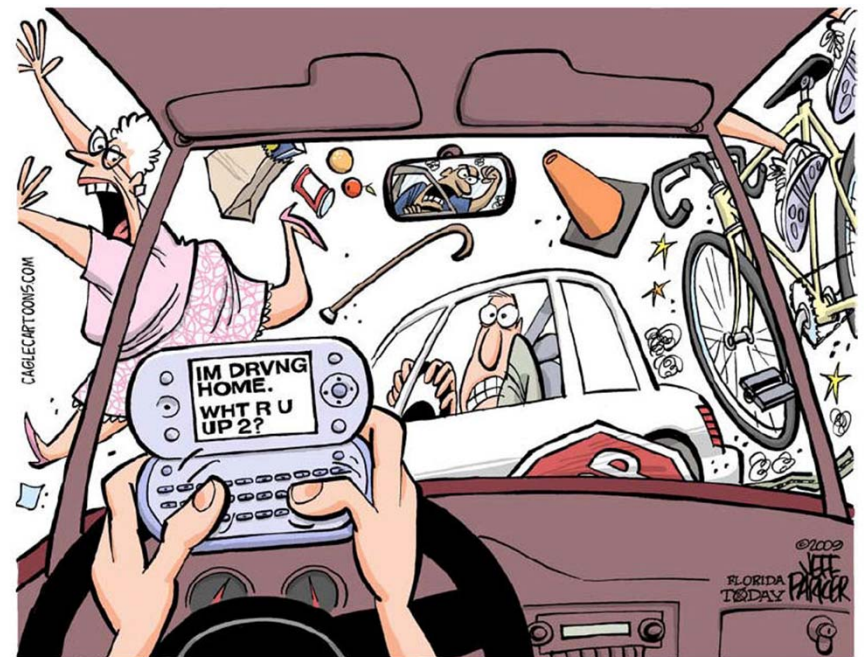
(Regan, Lee, & Young, 2008)

- 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)

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IM DRVNG HOME. WHT R U UP 2?

FLORIDA TODAY / JEFF PARKER ©2009

Jeff Parker / Florida Today, courtesy CagleCartoons.com

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).
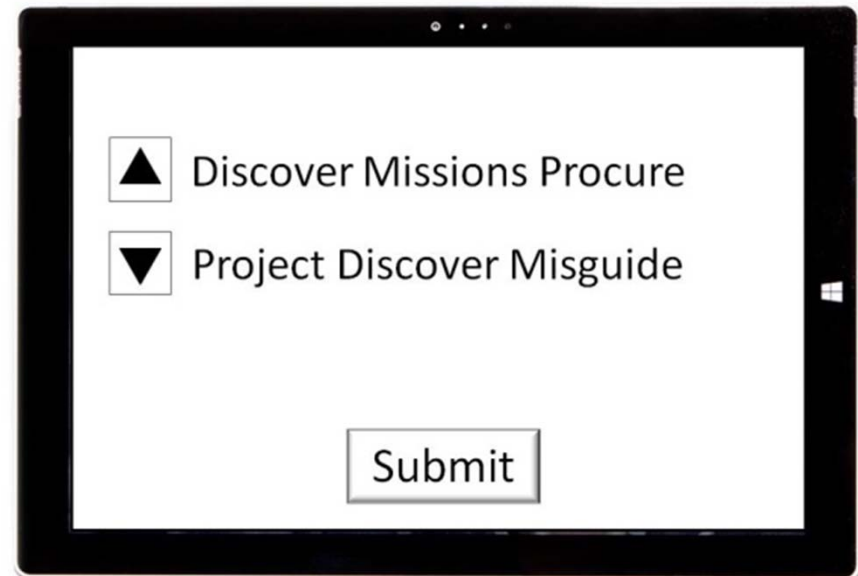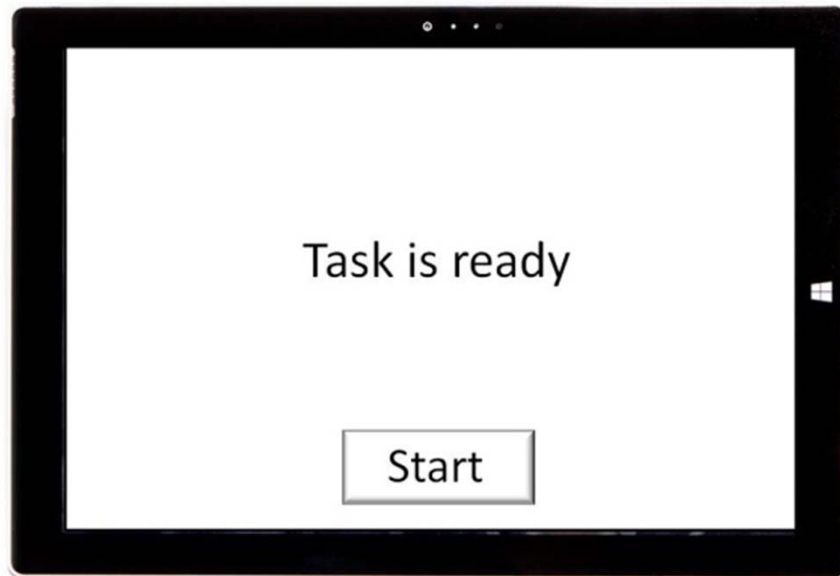
Experimental Design

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

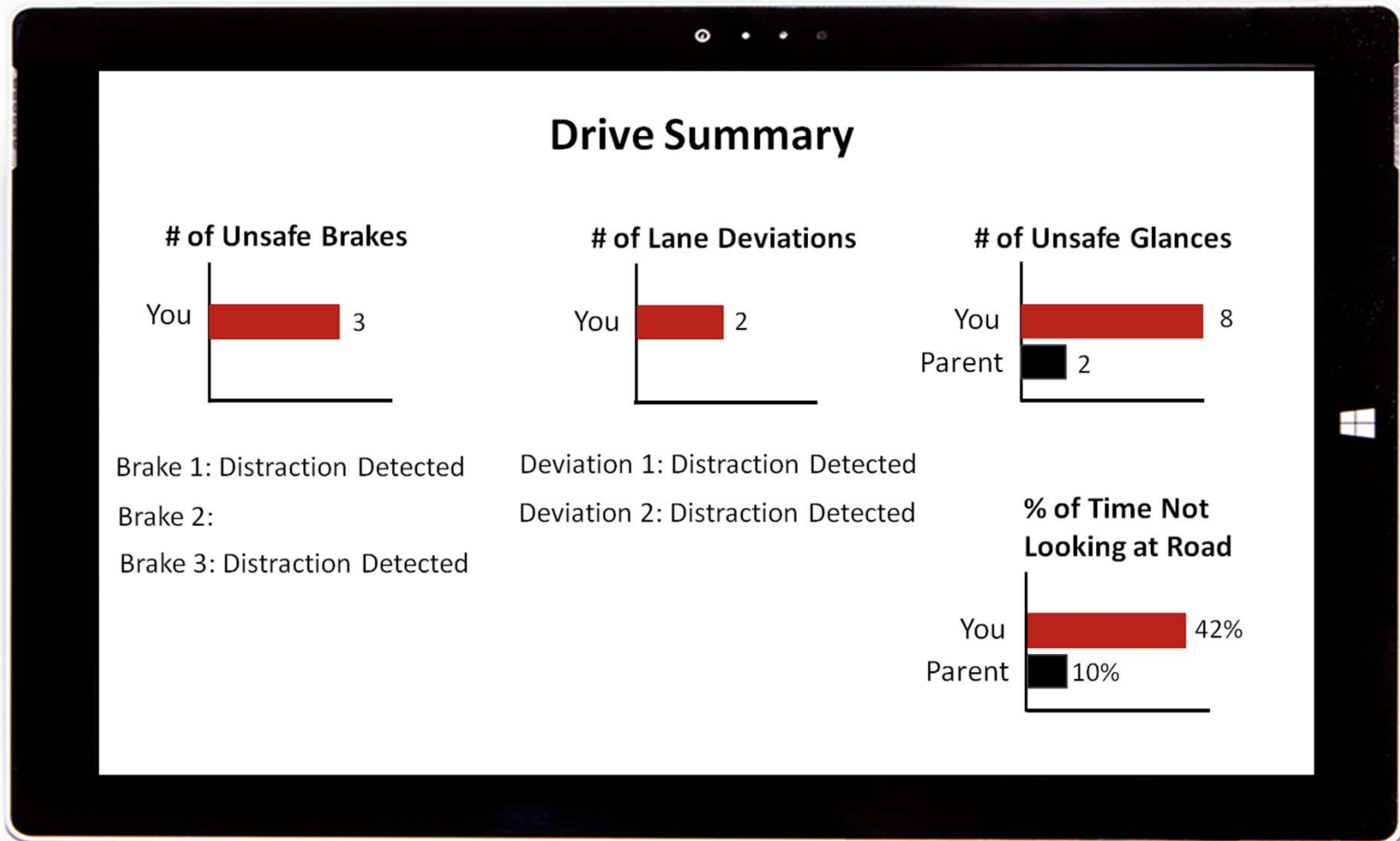Self-paced visual-manual secondary task (Donmez et al., 2007)
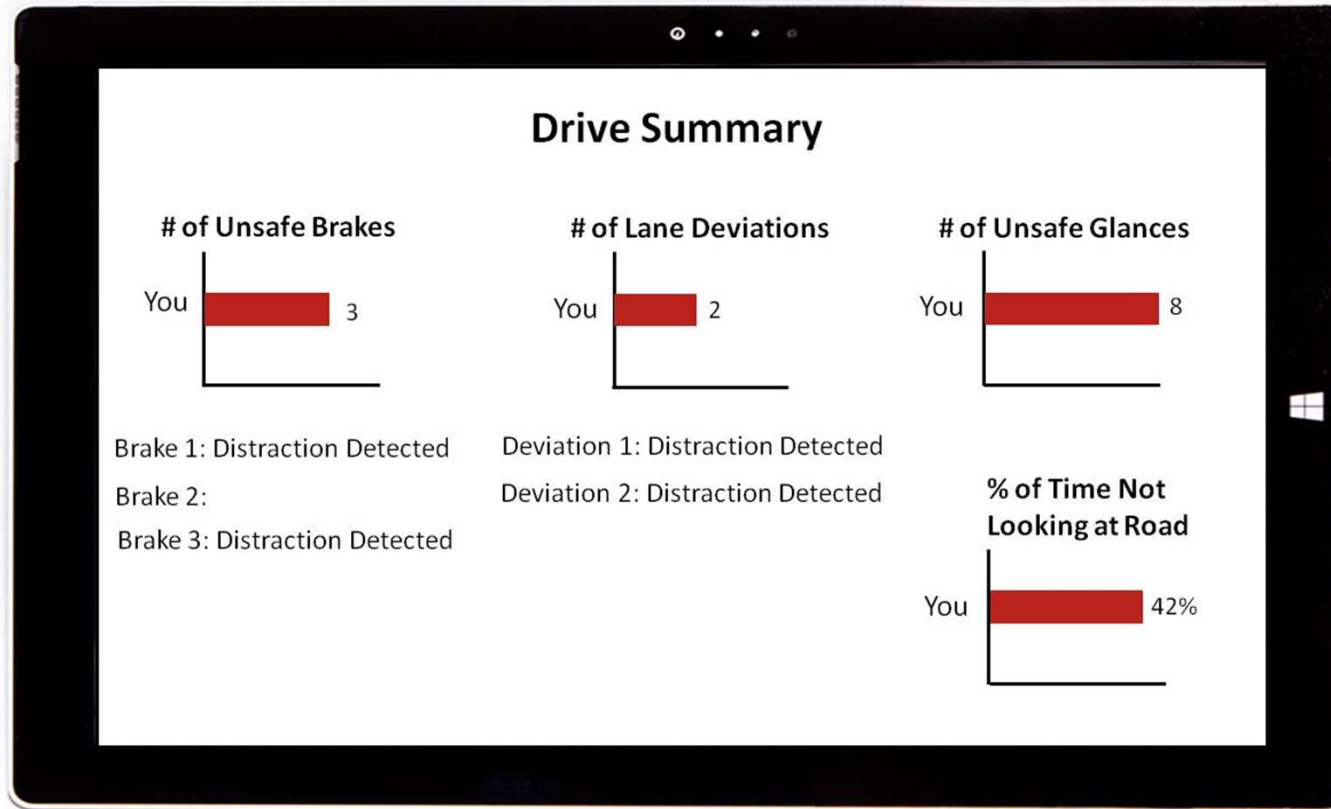
Intervention Systems

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%

12

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

No-feedback	Real-time	Post-drive	Social-norms
11	10	9	10

- 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
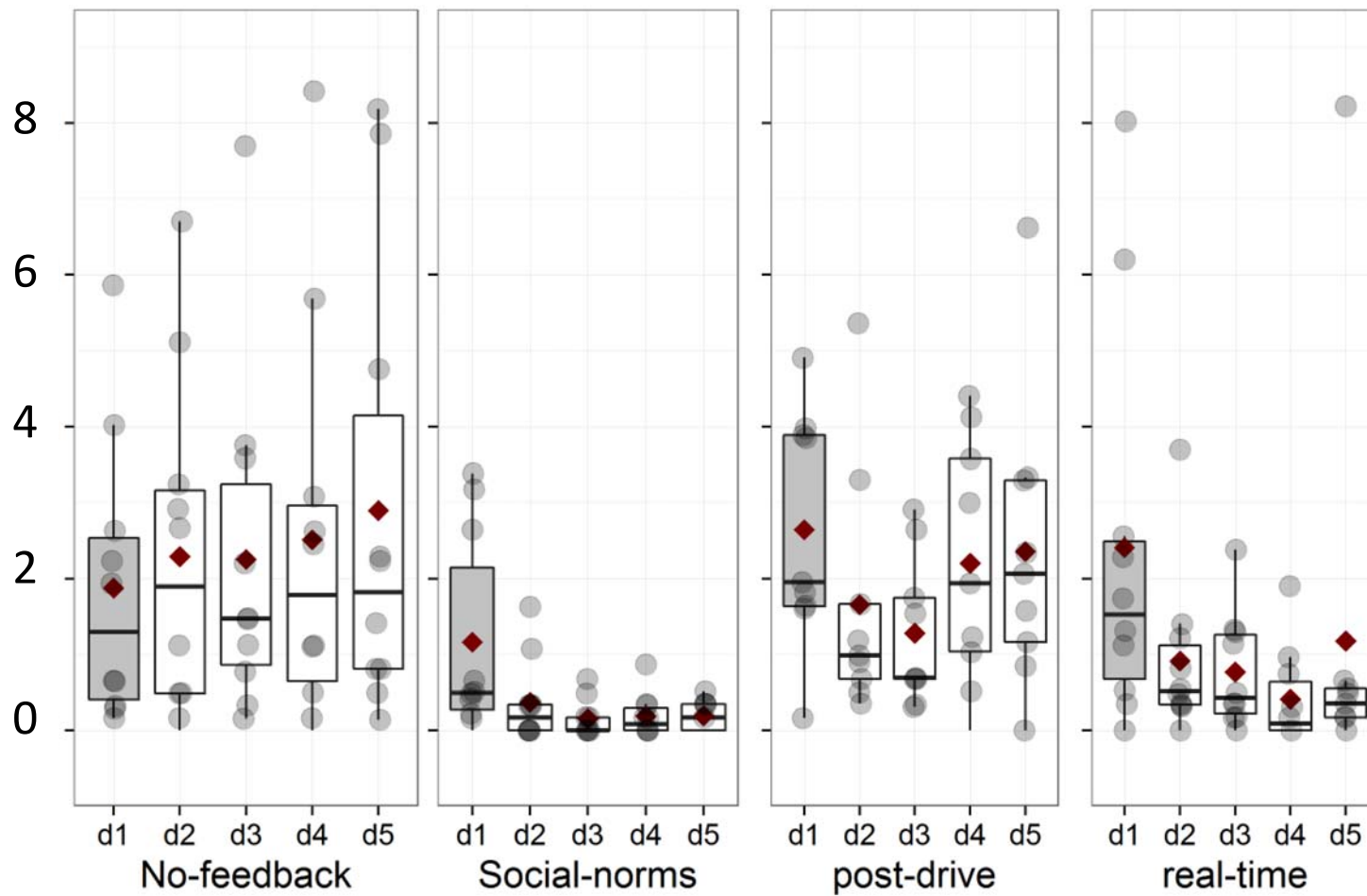- Number of manual interactions with the secondary task

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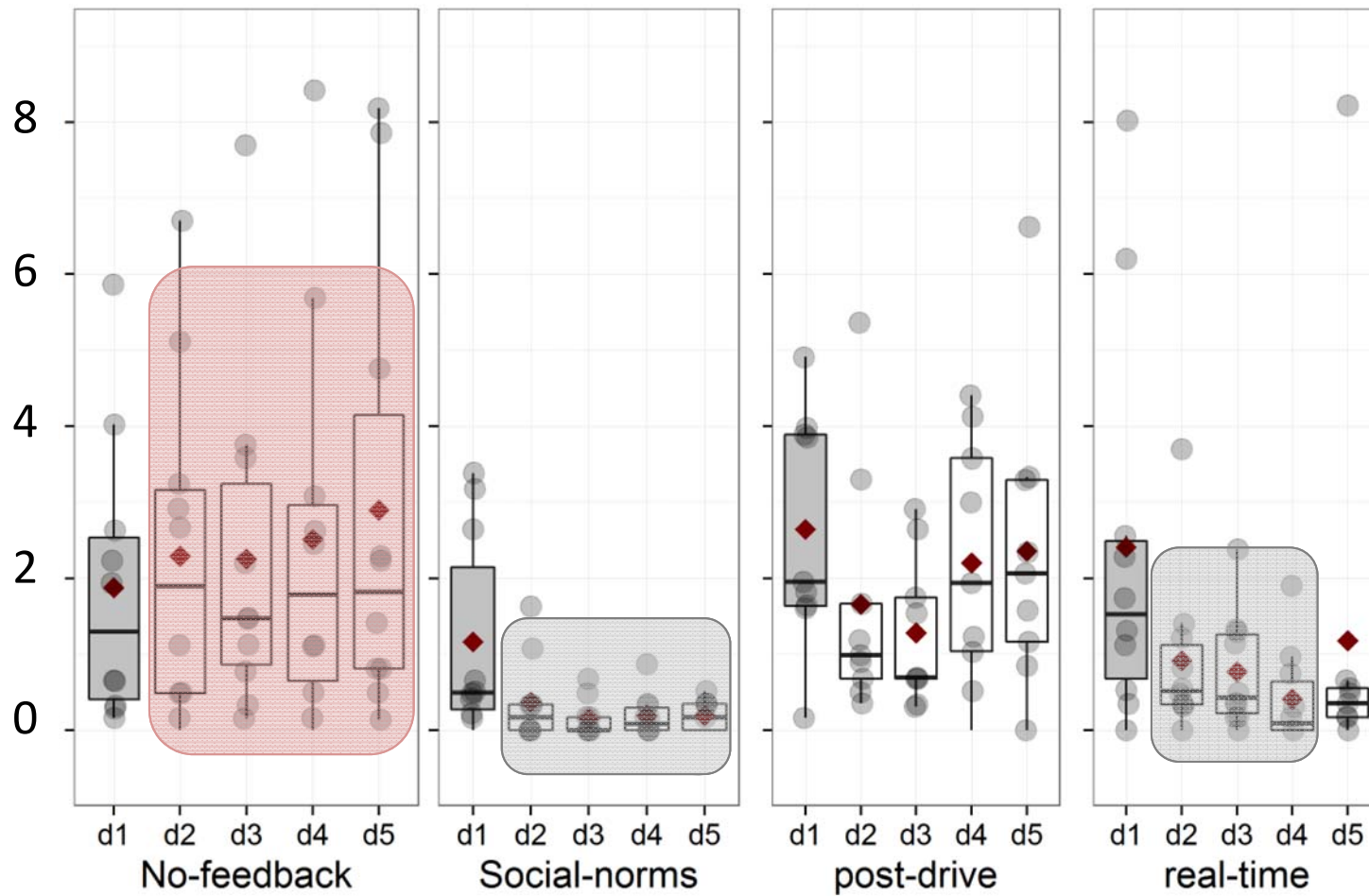- Minimum time to collision

Results

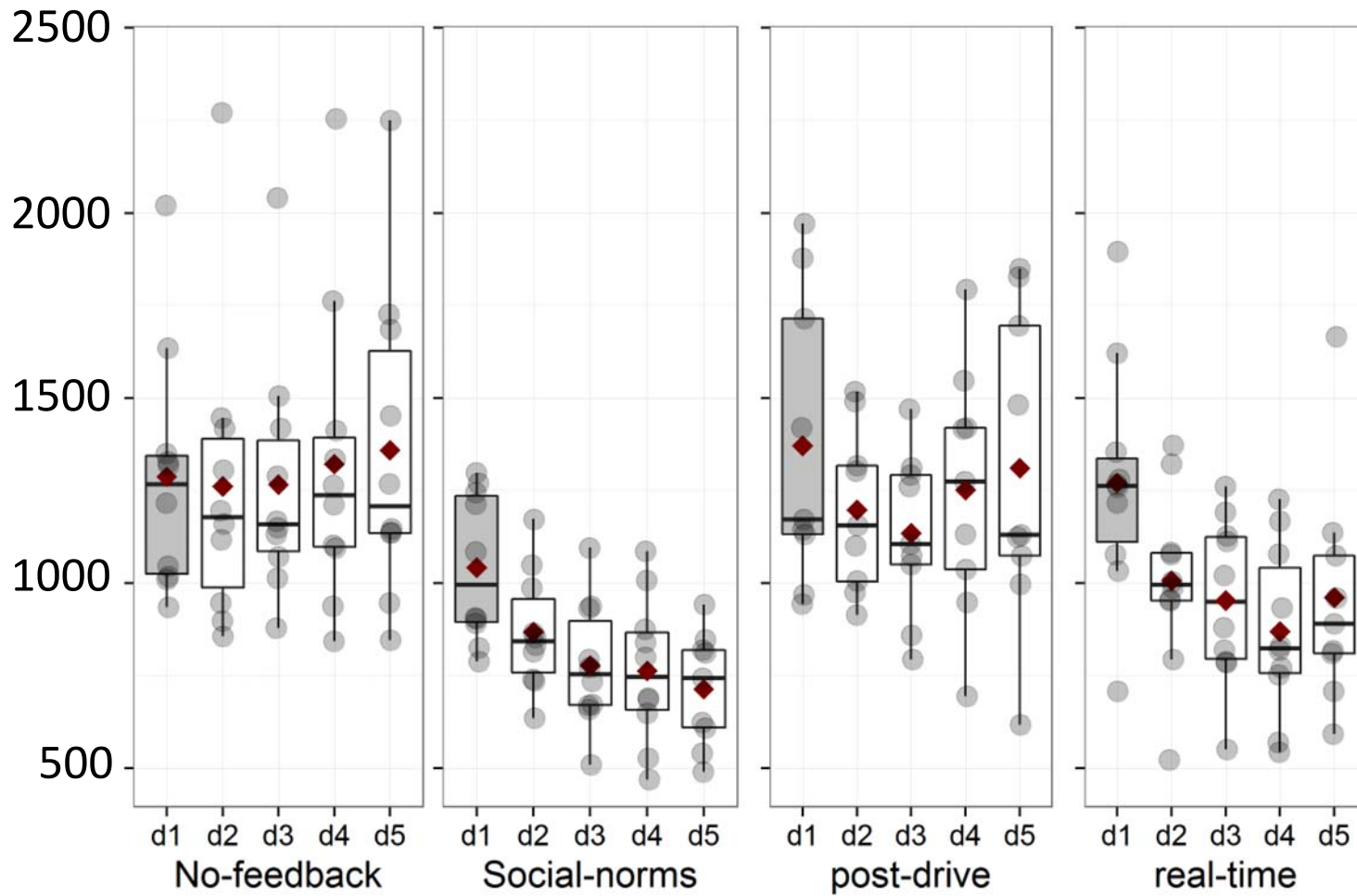Rate of long glances (>2 seconds) per minute

Results

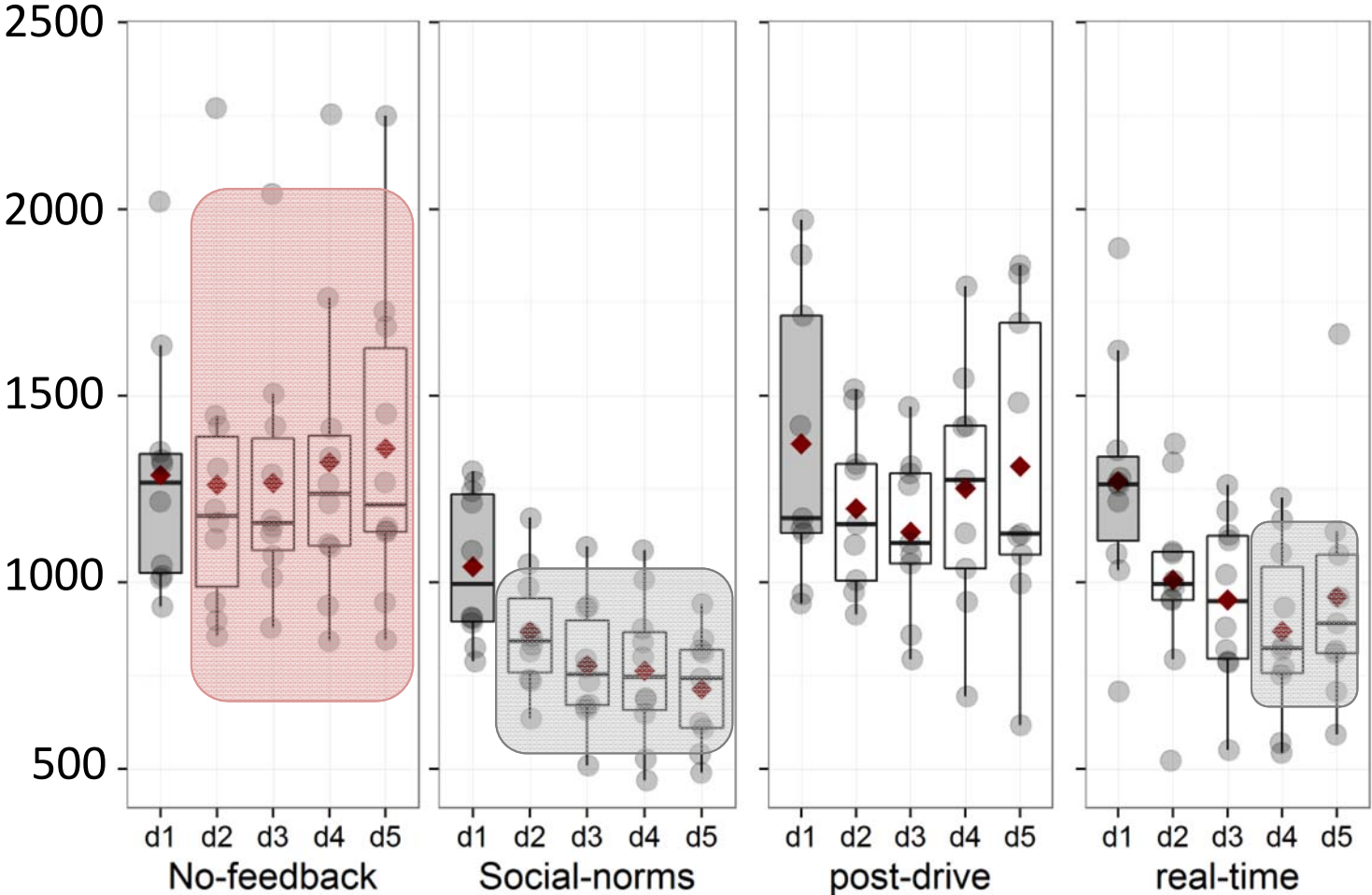Rate of long glances (>2 seconds) per minute

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