

Covert Texting During Simulated Driving Maneuvers

Effects of Head-Up versus Head-Down Posture

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Assumption

Texting while driving is BAD

Policy Response

Enact legislation to prohibit
texting while driving

Unintended Consequences

Crash rate among young drivers increased in 4-of-4 enacting states relative to risk-ratios in control states.

Insurance Institute for Highway Safety (September 28, 2010). Texting bans aren't reducing crashes in 4 states where they have been enacted. *Status Report*, 45 (10), 1-3.

Likely Explanation of Paradoxical Findings

- Younger drivers tend to ignore text bans
- Illegal status of texting behavior motivates covert (stealthy; out-of-sight) behavior
- Texting using a device held below the level of the instrument panel causes more exaggerated eyes-off-road behavior
- Reduced visual contact causes diminished situation awareness resulting in increased number of crashes

Testable Hypotheses Generated by Covert Texting Explanation

Drivers who engage in texting behavior will demonstrate degraded driving performance relative to baseline levels.

Drivers who engage in texting behavior while holding their phone out-of-sight will demonstrate greater degradations in driving performance than those who hold their phone at or near eye level.

Research Method

- Validated part-task driving simulator assessment of distraction effects
- N=16 young college students
- Assess driving performance during:
 - No texting control condition
 - Texting while holding phone “in clear sight”
 - Texting while holding phone “out of sight”(i.e., Head-Up versus Head-Down Texting)

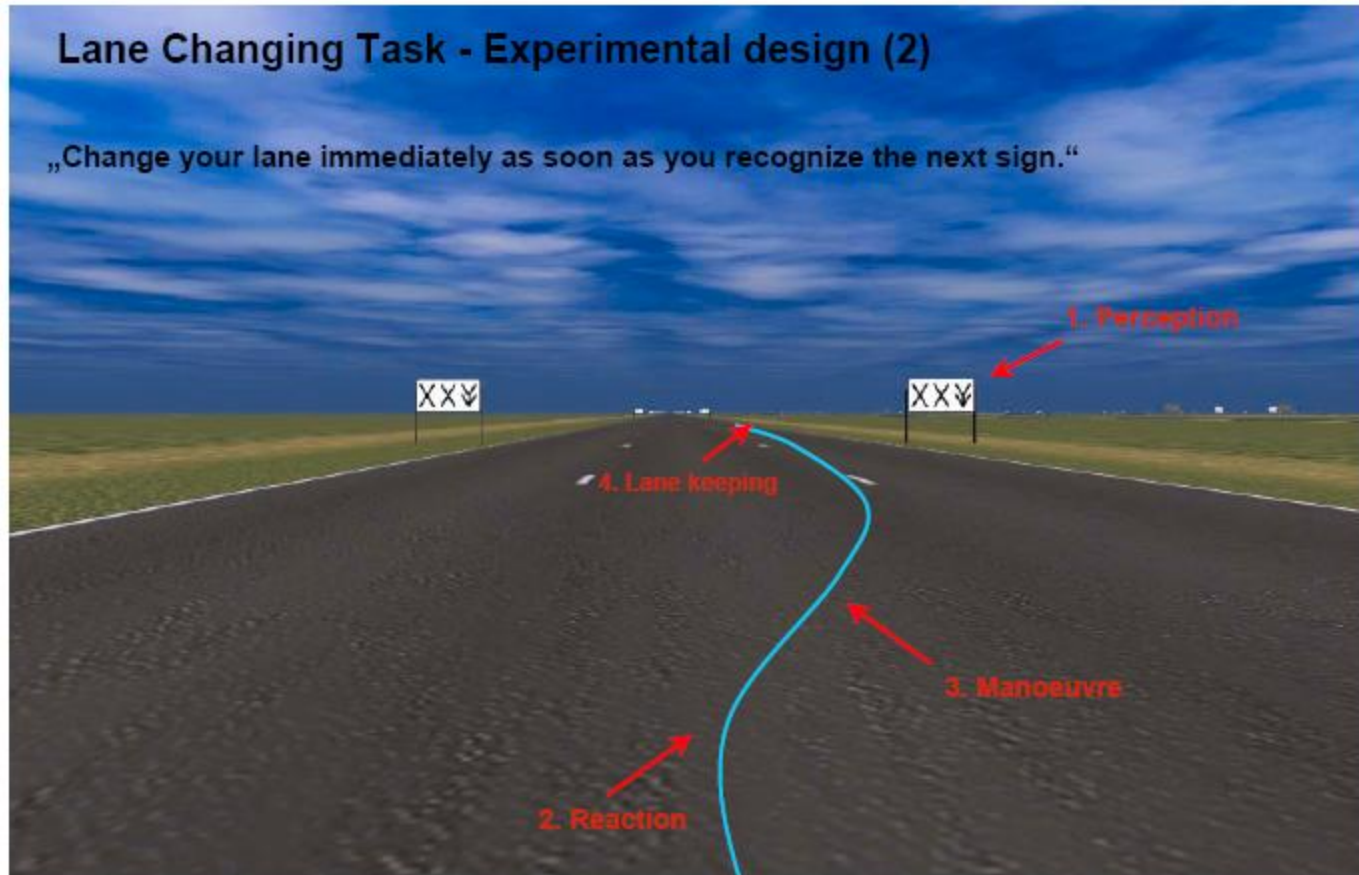
Research Method (continued)

- Varied cognitive load imposed by text query ('low' vs. 'high' load)
- Varied anticipated length of required text response to query ('short' vs. 'long' length)
- Participants used their own touch-screen phones to reply to text queries sent by experimenter (4 per experimental condition)
- 3.5 minute 'laps' of driving track:
practice lap driving only; practice lap texting;
first baseline lap; two experimental laps
(counterbalanced); second baseline lap

Lane Change Task (LCT)

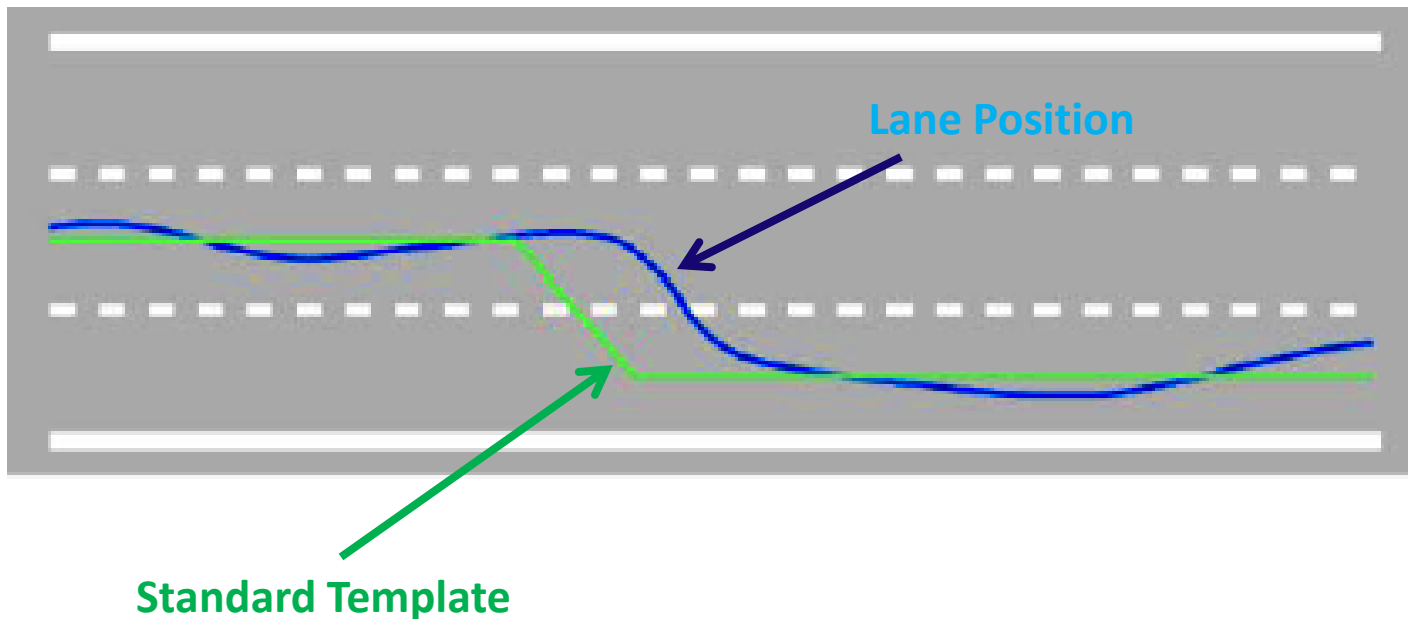
- PC-based part-task driving simulator
(steering wheel; accelerator & brake pedals)
- **ISO-26022 standard** for assessing distraction effects due to in-vehicle technology
- Real-time speed and lane position data logging
- Validated “goodness” of lane change maneuver metric (see below)
- User configurable stimulus preview time (1.2 sec)

Nature of the Lane Change Task



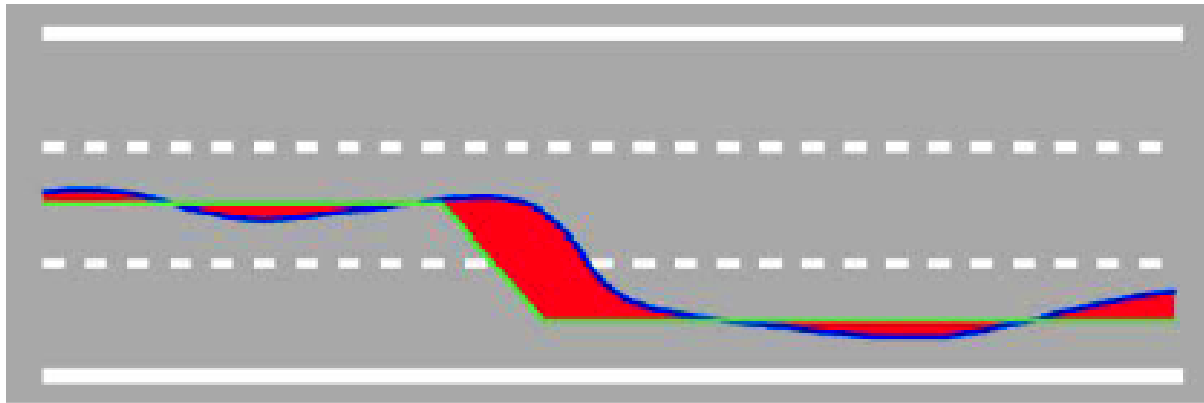
LCT Performance Metric

A simple **normative model** is used to assess driving performance



Total Deviation from Ideal Maneuver

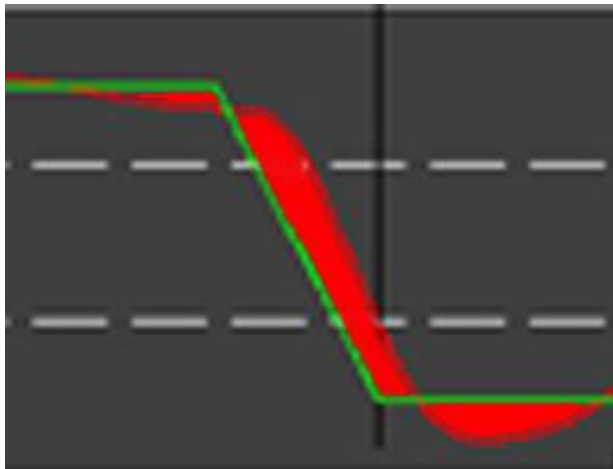
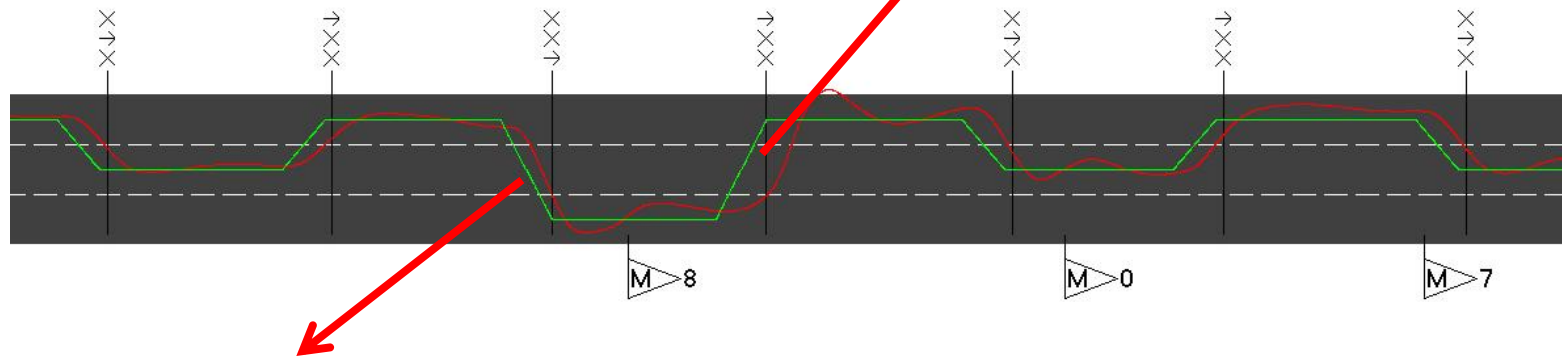
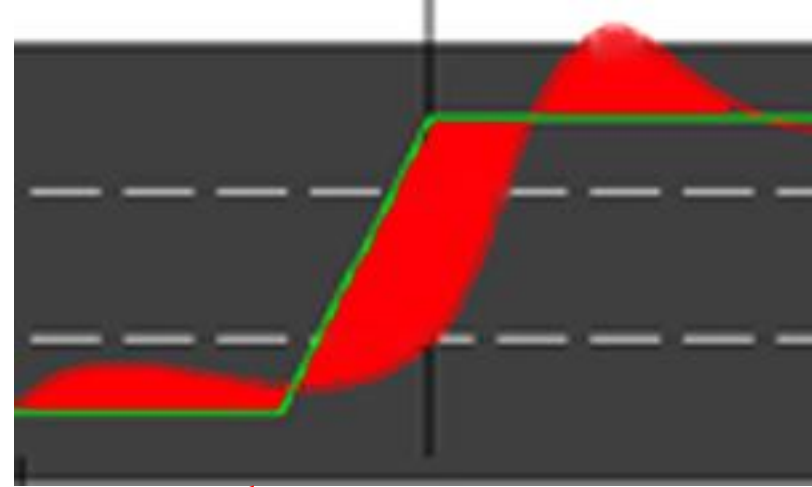
Area indicates driving quality.



- The area is sensitive to
- Perception (missed sign)
 - Reaction
 - Manoeuvre
 - Lane keeping

“Poor” lane change maneuver:

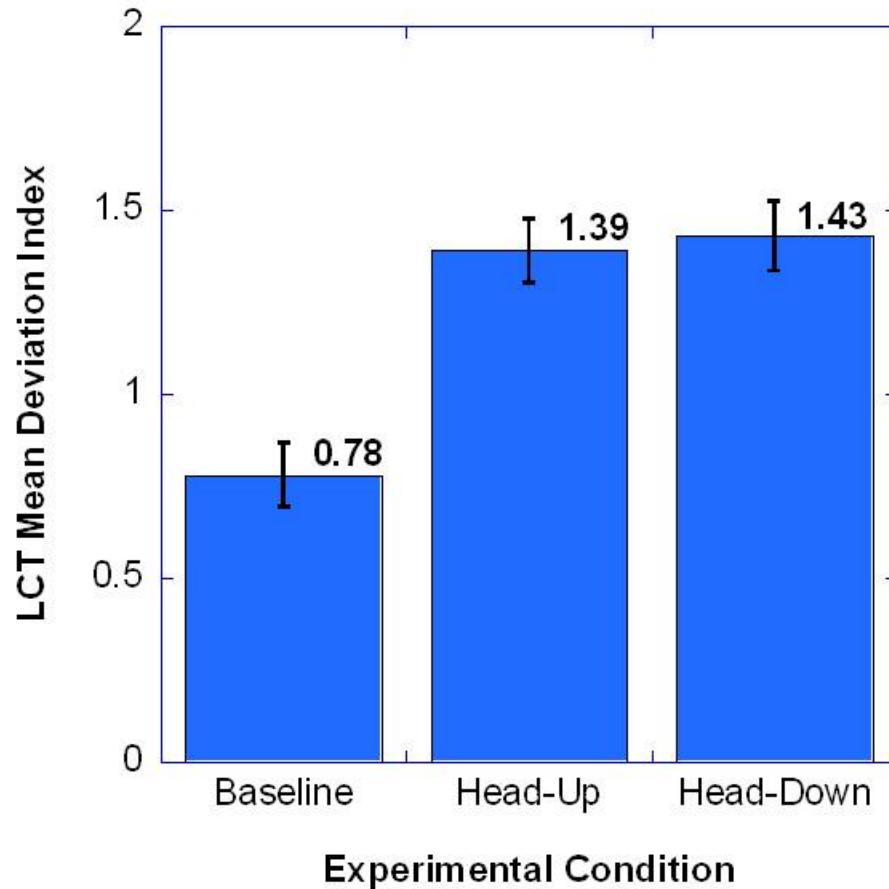
Large area between model and observation



“Good” lane change maneuver:

Small area between model and observation

Results



Lane Change Task error was significantly higher for both texting conditions relative to baseline [$F(2,30)=26.7, p < 0.001$]

Lane Change Task error observed was not significantly increased in the Head-Down (Covert) texting condition [$F(1,15)=0.04$]

Text message inquiries designed to elicit longer text responses tended to yield increased error on the Lane Change Task [$F(1,15)=2.8, p < 0.12$]

Conclusions

- Texting significantly impairs LCT performance
- Head-Down/Covert Texting performance decrement was not discriminable from Head-Up Texting condition
- Failure to support main experimental hypothesis may have resulted from predictable nature of LCT demands (i.e., predictable = manageable)
- Currently investigating the effects of texting postures on the detection and avoidance of unexpected hazards using more advanced driving simulator platform (Sam White M.A. Thesis Project)

CARS Driving Simulator

Car-Following Paradigm



Thank you for listening.

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Appendix

Table 1.
Interactive Texting Stimulus Questions:
Cognitive Processing Demands vs.
Anticipated Length of Reply

Low Processing Demand / Short Reply Demand

What are the colors of the American Flag?

What day of the week is it?

Higher Processing Demand / Short Reply Demand

What's the 14th letter of the alphabet?

What is half of 8 times 4?

Low Processing Demand / Long Reply Demand

What is your full home address?

Describe what you did last weekend in detail.

Higher Processing Demand / Long Reply Demand

What classes are you taking next semester?

What type of Subway sandwich do you get and
what fixings do you put on it?
