Information Processing Demands While Texting on a Simulated Driving Task

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Abstract

Research has revealed the negative impact that cellular conversation while driving has on one's ability to operate a vehicle (Beede & Kass, 2005; Hendrick & Switzer, 2007). The proliferation of text messaging devices has raised the question of the effect that texting has on driving performance. It was the purpose of this study to examine the effects of sending and receiving text messages on reaction time (RT) while performing a simulated driving task compared to the effects of other common distractions behind the wheel. RT, movement time (MT) and total response time (TRT) under four conditions were compared: Control (C) (driving only), eating/drinking (ED) (eating popcorn and drinking water), talking (T) (hand-held cell phone conversation) and texting (TX) (sending/receiving text messages). Participants (N=27) were tested on two days with the order of conditions randomly varied. They were seated at a driving simulator, with their right foot on a pedal. While simulating driving, participants reacted to a visual stimulus by moving their foot from one pedal to another. This protocol served as the control and one distraction task (ED, T, TX) was added for each of the experimental conditions. On day 1, participants completed two sets of 20 control trials and five practice trials each the other conditions. On day two, participants completed 20 trials of each condition. RT of each condition was significantly slower than the control. MT of each condition was significantly slower than the control. The same effect was found with TRT. Mixed ANOVA revealed that the TX means reported significant differences ($p < 0.05$) from each of the other three means. Results provide evidence of the dangers associated with distractions behind the wheel, with texting providing the most serious risk.

Purpose

To more systematically identify the strategies used by participants (compared to a previous study, Hendrick (2008)) in order to examine its effect on RT performance followed by speeded and non-speeded secondary tasks.

Figure 1. Simulated Driving Task

(showing Lafayette reaction/ movement time apparatus (model 63017), laptop with driving video image, foot pedals and Wii steering wheel.)

Data collected in the Motor Behavior Lab, SUNY Cortland.

Methods and Procedures

RT Task (refer to Figure 1)

- Moved right foot from right to left pedal in response to visual stimulus.
- 4 conditions (order randomly varied across subjects)
  - Control – Undistracted; Held steering wheel; Reacted as quickly as possible
  - Eat/drink – Same as control AND ate popcorn from bowl in lap and drank bottled water
  - Talking* – Same as control AND conversed on handheld phone
  - Texting* – Same as control AND texted on phone
- Conversed* with experimenter in other room
- Visual warning stimulus followed by randomly varied foreperiods (2, 3, 4 & 6 s);
- Day 1 – Practice, 20 trials under each condition
- Day 2 – 4 warm-up trials each; 20 test trials in each condition

Dependent variables: reaction time (RT), movement time (MT) & total response time

Analysis - Mixed 2 (sex) X 4 (condition) ANOVA (alpha = .05) with LSD post hoc test

Results

- Reaction Time (refer to Figure 2)
  - Significant Condition main effect, $F(3,75) = 29.436$, $p < .05$.
  - Control mean was significantly faster than all other conditions.
  - Texting mean was significantly slower than all other conditions.
- Movement Time (refer to Figure 3)
  - Significant Condition main effect, $F(3,75) = 28.703$, $p < .05$.
  - Same post hoc findings as with RT
- Total Response Time
  - Significant Condition main effect, $F(3,75) = 29.221$, $p < .05$.
  - Same post hoc findings as with RT and MT
- Sex differences – not significant for any variable ($p > .05$)

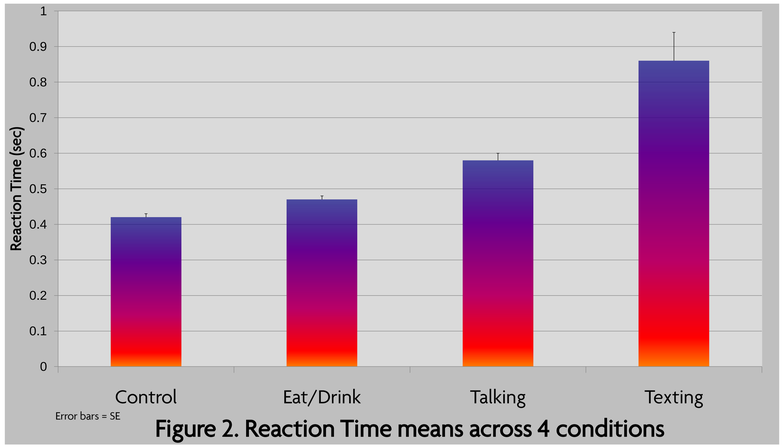

Figure 2. Reaction Time means across 4 conditions

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Discussion

Results support previous research on the negative effects of talking on cell phones (Hendrick & Switzer, 2007) and other object manipulation tasks while driving (Briem & Hedman, 1995). These tasks resulted in 39.7% and 13.4 % increase in RT compared to the non-distracted control, respectively. Texting showed an even greater increase as RT increased 106.9%, which is more than double that of talking on a cell phone. Since these data were collected in March 2009, much attention has been given to the detrimental effects of texting while driving. For example, Hanowski et al. (2009) reported that truck drivers who text increase their risk by more than 20% compared to non-distracted driving. It is not surprising why 26 states have passed laws to ban texting for all drivers (GHSA, 2010).

Conclusions

1. The manipulation of objects (food, drink and cell phones) while driving, even in a simulated task, increases the information processing demands and the speed of movement.
2. Texting while driving is a far greater detriment to drivers' response times than eating, drinking bottled water or talking on cell phones.

Key References

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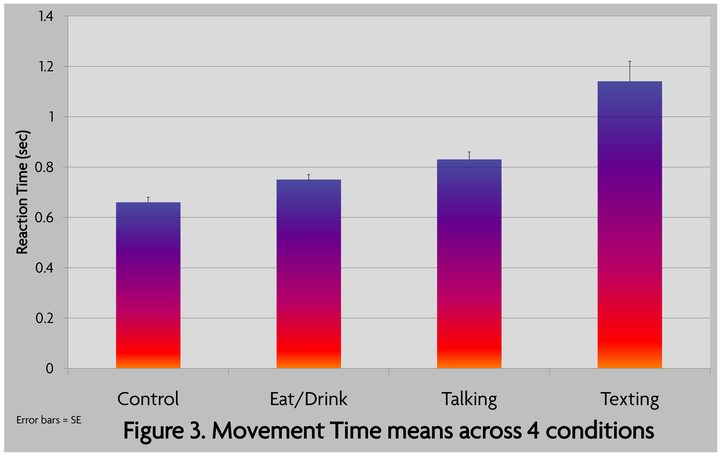

Figure 3. Movement Time means across 4 conditions

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