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Objective

A pilot study was conducted to determine the effect of distraction (e.g., texting and talking on the phone) and traffic congestion on visual attention during simulated driving.

Background

In 2010, 18% of the over one million injury-related motor vehicle crashes were directly related to distracted driving (Department of Transportation [DOT], 2012). An overall lack of attention while driving is the primary cause of motor vehicle crashes (National Highway Traffic Safety Administration [NHTSA], 2012). A major threat to attention while driving is the visual distraction associated with cell phone use, as it is reported that 13.5 million drivers use cell phones at any given moment (NHTSA, 2012). There are three types of distractions present while driving: visual, cognitive, and manual (Young, K & Regan, M, 2007). This study focuses on the visual distractions involved with cell phone use while driving. Research suggests that engaging in cell phone conversation while driving may lead to an increase in traffic congestion (Cooper, Vladisavljevic, Medeiros-Ward, Martin, & Strayer, 2009). As the relationship between texting and traffic congestion was unknown, this pilot study extended previous work with the inclusion of texting as a form of distraction under consideration.

Hypothesis

It was hypothesized that texting while driving required drivers to keep their eyes off of the road more than while engaged in cell phone conversation. Additionally, it was hypothesized that drivers would avert more attention from the road while texting during high traffic congestion than while talking on the phone or when no cellular distraction was present in medium or low levels of traffic congestion. This was suggested based on the assumption that drivers may be more willing to use their cellular device while traffic is at a standstill.

Method

Participants

Twelve individuals, ages ranging 17 to 25 years old (M age = 22.3 years, SD =2.91) (50% male; 50% African American), were recruited to participate as part of a larger study. Inclusion criteria included possession of a driver's license, possession and regular use of a cell phone with text messaging capability, and a willingness to use the personal cell phone during the session. Exclusion criteria for both groups included physical disabilities (e.g., visual or hearing impairment, use of a wheelchair).

Procedure

Participants drove in a STISIM™ (Systems Technology Inc.) simulator, which served as an interactive representation of the driving experience. Participants drove three times each, each time with one of three randomly presented distractions (cell phone, texting, and undistracted). Table 1 illustrates the repeated measures experimental design:

Table 1. Experimental Design

Distraction Condition (Presented in Random Order)	TXT	CP	ND
Congestion Level (Presented in Random Order)	Low, Medium, High	Low, Medium, High	Low, Medium, High

Note. TXT = text messaging; CP = cell phone; ND = no distraction. Participants drove three times each, each with three randomly ordered presented distractions (TXT, CP, & ND) in three randomly ordered presented traffic congestion levels (Low, Medium, High).

FaceLab Version 5™ (Seeing Machines Inc.) was used to track participants' eye gaze position as they drove in the simulator. The percentage of time in which the driver's eyes were not on the road was calculated by dividing time the participant's eyes were not focused on the simulator screen by the total time of the simulated drive multiplied by 100.

Data Analysis

Main effects of distraction and level of traffic congestion and the interaction were assessed using 3x3 Repeated Measures ANOVA (with Greenhouse-Geisser correction). Within Subjects Factors: Distraction and Congestion. Dependent Variable: Percent of time eyes off road (visual attention).

Results

There was a significant difference between distracted (CP & TXT) (M = 31% of drive, SD = 28%) as compared to not distracted (ND) across all congestion levels (M = 15%, SD = 19%) (Figure 1). Post hoc analyses revealed a significant difference in percentage of times that drivers took their eyes off the road between texting (M = 29%, SD = 19%) vs. not distracted (M = 15%, SD = 19%) (Figure 1). There was no significant difference among congestion levels regardless of distraction on the percentage of time that drivers took their eyes off of the road ($F(1.4, 15.1) = 0.03$, $p = 93$), and there was no interaction (each distraction measured across each congestion level) of distraction and congestion level on visual attention ($F(2.3, 25.2) = 0.48$, $p = .65$) (Figure 1).

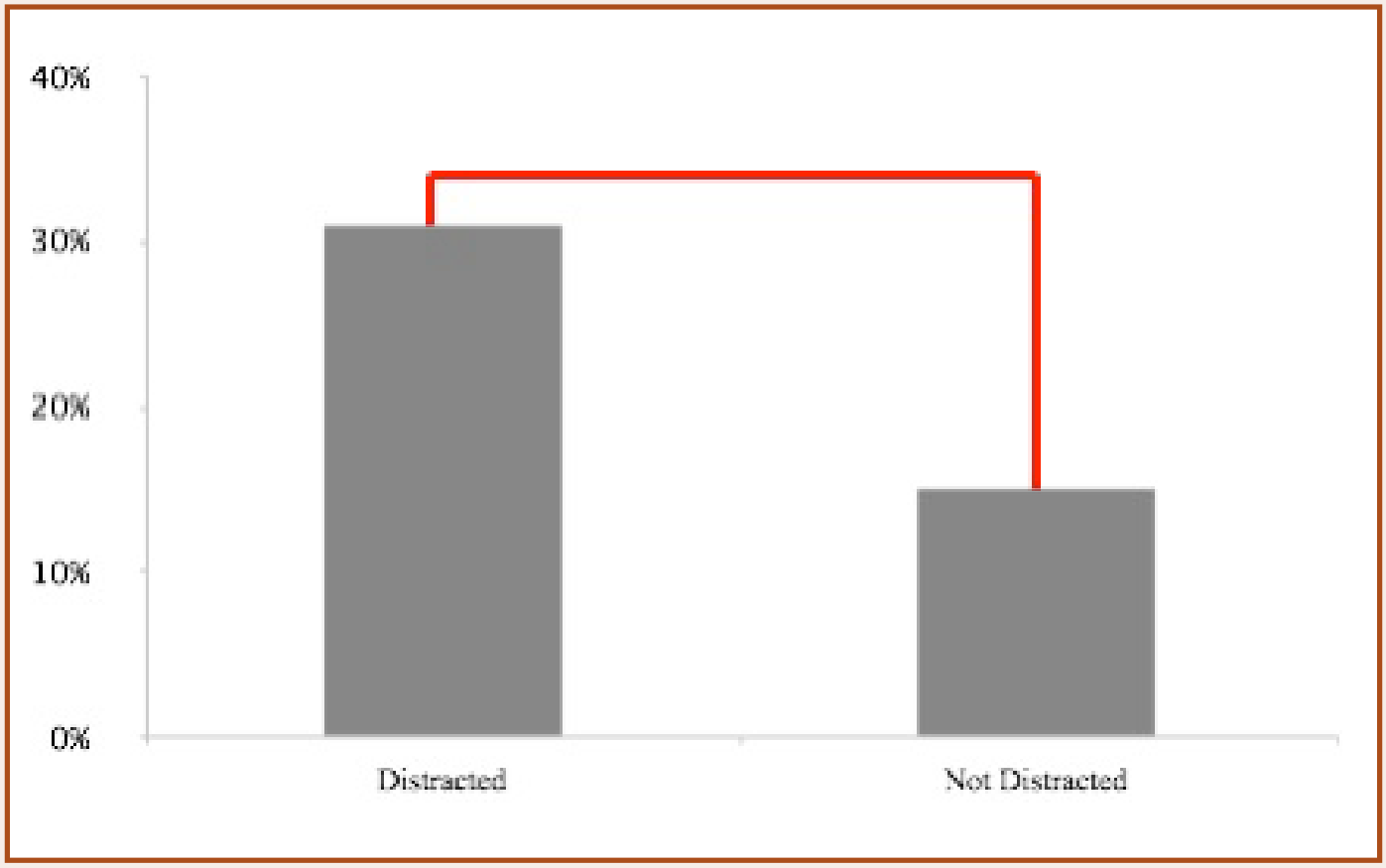

Figure 1. A significant main effect of distraction was revealed, $F(1, 11) = 9.42$, $p=.01$
** Indicates the significant difference between distraction (TXT and CP) and no distraction (ND)*