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Emergency response driver training: Dual-task decrements of dispatch communication

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ABSTRACT

The present study examined the performance of law enforcement students during simulated emergency vehicle driver training in order to evaluate to potential of the training program to reduce the negative effects of dual-task driving and to identify aspects of driving performance that are impaired in dual-task conditions among first responders. It has been repeatedly shown that combining driving and cell-phone use significantly impairs driving performance. Although civilians may choose not to communicate while driving, this is not possible for emergency response drivers, especially when responding to a life or death call. This is particularly true for police officers who must be in constant communication with their dispatch operators, as their calls often involve suspect movements or escalated violence. One hundred and fifty six Canadian law enforcement students completed a series of simulated emergency response driving scenarios as part of their regular training. Students' drives were scored in accordance to the organization's standards and scores were analyzed to identify areas of impairment that occurred during dual-task requirements. These results indicate that the training alleviated the negative effects of concurrent communication, but speed and lane position maintenance were negatively impacted during the most complex dual-task conditions. Identifying ways to improve driving performance under such conditions is imperative and these results suggest that emphasis on speed and lane position maintenance while communicating within various contexts may be useful to increase the safety of first responders. These results contribute to developing evidence-based training and procedures for first response drivers.

1. Introduction

The dangers of driving while texting or talking on the phone have been well established (Lamble, Kauranen, Laakso, & Summala, 1999; Strayer & Drews, 2004; Strayer & Johnston, 2001), yet deaths resulting from distracted driving continue to rise, while those of substance-impaired driving have remained stable (Wilson & Stimpson, 2010). Although drivers may be aware of the effects of distracted driving and are confident they can manage these risks, many drivers may not be aware that these distractions are still impacting their driving behaviours (Lesch & Hancock, 2004). As a result of the evident risks and negative effects of distracted driving, several laws have been implemented internationally that prohibit some or all cell phone use while driving (Cellular-News, 2007).

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Although emergency vehicle drivers are not exempt from laws that prohibit cell phone use, they are necessarily exempt from such laws that may prohibit them from communicating with their dispatch operator. However, it is possible these trained professionals still experience performance decrements under dual-task conditions. Bean and Noh (2010) demonstrate that 54% of law enforcement officer fatalities 'on the line of duty' are vehicular. Therefore, it is imperative to better prepare first responders for performing simultaneous tasks while driving. First response drivers are an important population to study because of their requirement to communicate with dispatch operators while driving under complex conditions. While civilians have the option to stop or pause a secondary task, first responders do not have this option, as delays in response time can mean the difference between life and death. The purpose of the current study is evaluate the impact that emergency response driver training has on dual-task driving impairments and to determine what aspects of first responders' driving are influenced during dual-task situations, as well as to identify potential features of the dual-task requirements that most impair driving performance.

The ability to execute two tasks simultaneously has seen considerable experimental investigation (e.g., Kahneman, 2011; Spelke, Hirst, & Neisser, 1976). Even tasks that are not particularly physically or intellectually demanding interfere with the ability to effectively perform another task concurrently. Using the capacity-sharing model, Pashler (1994) suggests that all tasks require mental resources from a shared pool and any combination of tasks requires sacrificing resources previously allocated to another task. For example, Kahneman (2011) and Li, Lindenberger, Freund, and Baltes (2001) discuss how performing math problems while walking will cause individuals to slow down or stop walking altogether as problem difficulty increases. The effect of sharing mental resources has been found to be detrimental to civilian drivers (Strayer, Drews, & Crouch, 2006); however, the effect on first response drivers has yet to be established.

One familiar topic of dual-task research investigates driving in combination with the use of a cell phone (e.g., Alm & Nilsson, 1994, 1995; Lesch & Hancock, 2004; Strayer & Johnston, 2001). This area of research has been given considerable attention because of the danger that exists when a driver is distracted by a cellular conversation. Cell phones involve speech comprehension and production and handheld devices involve the visual-motor task of dialing or texting. The deleterious effects of these tasks are evidenced by Strayer et al. (2006), who observed that civilian drivers cause significantly more rear-end collisions when conversing on a cell phone.

First responders face the same situations as cell phone users through communication with dispatch officers. This communication requires both conversation and the manual manipulation of a remote radio device while driving, often at high speeds. Research investigating performance differences has established that driving performance, as measured by lane position, following distance, and speed maintenance, is equally impaired by both hands-free and handheld cell phone use (Brookhuis, de Vries, & de Waard, 1991; Lamble et al., 1999; Strayer & Johnston, 2001). While there is a rich field of literature with civilian drivers, there is a paucity of research investigating first response drivers, who may differ because of their professional training. Past studies on civilian driving performance have focused on important factors such as attention (Cnossen, Rothengatter, & Meijman, 2000), cognitive load (Recarte & Nunes, 2003), and communication (Lansdown & Stephens, 2013), which are all critical to understanding the driving performance of first responders.

1.1. Attention and cognitive load

Cnossen et al. (2000) found inattention to be a contributing factor in 30–50% of simulated vehicular collisions. Young and Salmon (2012) observed that when attention is diverted away from the driving task, speed and lane position maintenance are adversely affected. Increasing cognitive load, such as attempting to hold information in memory or performing mental arithmetic, similarly impairs driving performance (Lamble et al., 1999; Recarte & Nunes, 2003; Ross et al. 2014). Furthermore, Strayer, Drews, & Johnston (2003) found that performance deficiencies related to cell phone use, especially collisions, were more pronounced in high-density traffic conditions. Although lane position maintenance during dual-task driving has been shown to decrease when the road conditions require the driver's focus, lane position maintenance has also been shown to improve when drivers did not have to focus on corrective steering measures (Medeiros-Ward, Cooper, & Strayer, 2014).

During a visual-motor task, viewing and manually responding to a surrogate in-vehicle navigation device, Jamson and Merat (2005) found that participants' speed and corrective steering maneuvers increased. Mental arithmetic has also been found to increase lateral vehicle movement (Lamble et al., 1999), reduce speed maintenance (Lewis-Evans, de Waard, & Brookhuis, 2011), and reduce visual anticipation, suggesting that one's ability to look ahead is compromised by a secondary mental task (Lehtonen, Lappi, & Summala, 2012). Furthermore, when mental tasks are combined with driving tasks, visual search is compromised and drivers reduce the number of glances at a speedometer or rear-view mirror (Recarte & Nunes, 2000). These findings are particularly concerning for emergency vehicle drivers, as the attention of first responders may often be diverted from the driving task by receiving and responding to updates from their dispatcher, mentally calculating their estimated time of arrival, or mentally simulating procedures that may be required of them upon arrival.

1.2. Communication

Mobile or personal communication will also affect performance by increasing the driver's cognitive load, which will negatively influence various driving behaviours. Concurrent communication has been shown to delay reactions to traffic signals and delay braking onset (Strayer et al., 2003; Strayer & Johnston, 2001). Inducing cognitive load by cell phone use similarly decreases reaction time and increases lane position deviations (Alm & Nilsson, 1994, 1995; Brookhuis et al., 1991; Lamble