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Distracted Driving in Teens With and Without Attention-Deficit/Hyperactivity Disorder

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Objective This study is among the first to examine the effect of talking on a cell phone or text messaging while driving in teens with and without attention deficit/hyperactivity disorder (ADHD).
Method: Teens (average age 17 years) with a diagnosis of ADHD (N = 16) were matched with typically developing controls (N = 18). All participants operated a driving simulator while (1) conversing on a cell phone, (2) text messaging, and (3) with no distraction during a baseline condition. Six indicators of driving performance were recorded: (a) time to complete the drive; (b) lane deviations; (c) variability in lane position (i.e., root mean square [RMS]); (d) reaction time; (e) motor vehicle collisions; and, (f) speed fluctuation.
Results: Significantly greater variation in lane position occurred in the texting task compared to no task and the cell phone task. While texting, in particular, teens with ADHD took significantly less time to complete the scenario. No significant main effects of group were found.
Conclusions: Generally, those with ADHD did not differ in regard to driving performance, when compared to controls, with the exception of one outcome: time to complete scenario. These findings suggest that distracted driving impairs driving performance of teen drivers, regardless of ADHD status. Texting while driving had the greatest negative impact on driving performance, particularly with regard to variability in lane position (i.e., RMS). This study sheds light on key issues regarding injury prevention, with the intent of providing pediatric care providers with the knowledge to inform teen drivers of risks associated with distracted driving which will ultimately result in reduced rates of motor vehicle crashes and concomitant injuries.
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Teen Motor Vehicle Collisions

THE PURPOSE OF this study was to examine the impact of distracted driving, one of the leading contributors to motor vehicle collisions (MVCs), on driving performance of teens with and without attention deficit/hyperactivity disorder (ADHD). Motor vehicle collisions (MVCs) are the leading cause of mortality among teenagers, accounting for approximately one in three deaths among persons between the ages of 16 and 19 (Centers for Disease Control and Prevention [CDC], 2012). A variety of factors increase MVC risk for teen drivers: (1) they may be less able to anticipate and identify hazards than older, more experienced drivers; (2) they may be more willing to engage in risky behaviors than older, more experienced drivers (Lee, McElheny, &

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Gibbons, 2007); (3) they may lack the skill and judgment required to drive effectively and safely through dangerous environments (e.g., driving in the rain or in high traffic areas) (McGwin & Brown, 1999); and (4) given their proneness to impulsive behavior, they may be particularly vulnerable to distraction (Williams, 2003). Understanding the complexities of distraction is particularly important because distracted driving has been implicated as the cause of at least one in every five MVCs in which at least one person was injured or killed (CDC, 2014).

Distraction as a Risk Factor

Poor behavioral control known to exist among teens allows for distractions to become much more dangerous for them than for any other age group of drivers (Williams, 2003). While dangerous for any driver, distractions are significantly more detrimental to teen drivers because the task of driving demands more of their cognitive resources (Goodwin, Foss, Harrell, & O'Brien, 2012). Distracted driving occurs whenever a driver's attention is diverted from the primary driving task to an object, person, task, or event not related to driving (Olsen, Shults, & Eaton, 2013). Although distractions can encompass many different activities (e.g. eating, drinking, reading, reaching for items in the car), use of a cell phone (whether interacting, dialing, answering) is the most commonly studied and, according to some researchers, possibly the most dangerous form of distracted driving (Goodwin et al., 2012). This is due, in part, to the fact that cell phone use has become increasingly more common over the past few decades, and more and more people are interacting with devices while driving (CDC, 2014).

Additionally, it is well established in the literature that cell phone use compromises the performance of young drivers (Caird, Willness, Steel, & Scialfa, 2008; Drews, Pasupathi, & Strayer, 2008; Horrey, Wickens, & Consalus, 2006; Reimer, Mehler, D'Ambrosio, & Fried, 2010). However, a limited number of studies have examined cell phone distraction in novice, teen drivers (Klauer et al., 2011; Shinar, Tractinsky, & Compton, 2005). Neyens and Boyle (2008) concluded that cell phone distraction may greatly increase the risk and severity of MVC-related injury and death for novice, teen drivers because of their relative inexperience and diminished attentional capacities.

Attention-Deficit/Hyperactivity Disorder

The increase in the likelihood of risky driving behavior and difficulties in attention regulation makes drivers with ADHD possibly even more susceptible to driving distractions (Reimer et al., 2010). Teens with ADHD represent a particularly vulnerable driver population whose disabilities may only exacerbate the already cognitively demanding task of learning to drive and then doing so safely (Barkley & Cox, 2007; Jerome, Habinski, & Segal, 2006; Jerome, Segal, & Habinski, 2006; Reimer et al., 2010). ADHD is a neurodevelopmental behavior disorder affecting an 8.5% of the population (Froehlich et al., 2007), with males overrepresented at a ratio of three to one (Barkley, 2005). Teenagers with the combined type of ADHD (ADHD-C) are characterized as having impulsive, hyperactive, and inattentive behavior patterns (Diagnostic & Statistical Manual of Mental Disorders– Fourth edition [DSM-IV], 1994), as well as deficits in executive functioning (Barkley, 2005). Studies have shown that teens with ADHD-C are more likely to engage in risky driving, but few studies have experimentally examined the potential increased risk that cell phone conversations or text messaging may introduce for typically developing, novice, teen drivers and their same age counterparts who have been diagnosed with ADHD-C (Barkley, Guevremont, Anastopolous, DuPaul, & Shelton, 1993; Barkley, Murphy, DuPaul, & Bush, 2002; Laberge, Ward, Manser, Karatekin, & Yonas, 2005).

Reimer et al. (2010) conducted one of the first driving simulator studies to investigate the effects of distracted driving on young drivers, ages 17 to 24, with and without ADHD. Participants were asked to navigate a high-stimulus, urban roadway while completing a phone task then, to navigate a low-stimulus, highway while completing a secondary task. During the highway scenario, drivers with ADHD had significantly more speed fluctuation and speed limit exceedances for longer distances compared to controls, suggesting that driving impairments associated with ADHD are most prevalent in non-demanding driving scenarios, such as low-stimuli highways. Although the study incorporated talking on a cell phone conversation as a distraction task, Reimer et al. (2010) did not examine the effects of text messaging, a dangerous activity that has since arisen as a prominent topic of societal importance since previous efforts. Because drivers with ADHD are one of the most "at risk" driver groups, and because teenagers are the most likely of all age groups to text while driving (CDC, 2014), it is very important to have an accurate understanding of the effects of text messaging on this exceedingly vulnerable population.

In addition to having a no-distraction and a cell phone conversation condition, Narad et al. (2013) introduced text messaging as a distraction task in their comparison of ADHD and typically developing controls' simulated driving. Also, during the three distraction conditions, teens were presented with a single 'unexpected event' such as a car unexpectedly merging or a pedestrian crossing the street. Results were consistent with adult studies of ADHD drivers (see Vaa, 2014 for a review) in that regardless of whether ADHD teens were distracted or not, teens with ADHD exhibited greater variability in their lane position and speed than teens without ADHD. As expected, texting while driving also negatively impacted several indices of driving performance (i.e., speed, speed variability and variability in maintaining lateral lane position) for both ADHD and non-ADHD drivers (Narad et al., 2013). However, there were no significant group differences (ADHD vs. control) or task differences (no distraction vs. cell phone conversation vs. text messaging), even with regard to number of crashes. Further, no significant group or task differences were found when looking specifically at response to 'unexpected events,' likely because the 'unexpected event'

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