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Distracted Driver Behaviors and Distracting Conditions Among Adolescent Drivers: Findings From a Naturalistic Driving Study

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A B S T R A C T

Purpose: The proliferation of new communication technologies and capabilities has prompted concern about driving safety. This concern is particularly acute for inexperienced adolescent drivers. In addition to being early adopters of technology, many adolescents have not achieved the degree of automaticity in driving that characterizes experienced adults. Consequently, distractions may be more problematic in this group. Yet little is known about the nature or prevalence of distracted driving behaviors or distracting conditions among adolescent drivers.

Method: Vehicles of 52 high-school age drivers (N = 38 beginners and N = 14 more experienced) were equipped for 6 months with unobtrusive event-triggered data recorders that obtain 20-second clips of video, audio, and vehicle kinematic information when triggered. A low recording trigger threshold was set to obtain a sample of essentially random driving segments along with those indicating rough driving behaviors.

Results: Electronic device use (6.7%) was the most common single type of distracted behavior, followed by adjusting vehicle controls (6.2%) and grooming (3.8%). Most distracted driver behaviors were less frequent when passengers were present. However, loud conversation and horseplay were quite common in the presence of multiple peer passengers. These conditions were associated with looking away from the road, the occurrence of serious events, and, to a lesser extent, rough driving (high g-force events).

Conclusions: Common assumptions about adolescent driver distraction are only partially borne out by in-vehicle measurement. The association of passengers with distraction appears more complex than previously realized. The relationship between distractions and serious events differed from the association with rough driving.

IMPLICATIONS AND CONTRIBUTION

Because of measurement challenges, little is known about the nature or prevalence of distractions among adolescent drivers. Using a small in-vehicle camera, we were able to see distracting conditions and count distracted driver behaviors. All distractions were uncommon; chaotic conditions involving multiple passengers, although uncommon, appeared most risky.

Drivers have always had the opportunity to eat, chat with passengers, and engage in a variety of nondriving-related activities while operating a vehicle, and these have long been known to contribute to crashes [1]. Recently, distracted driving has come to the forefront of public awareness and the concern of injury prevention researchers, stemming in large part from the rapid increase in cell phone ownership and the explosion in availability of other portable and in-vehicle electronic devices (EDs). By their nature, these technologies can absorb more driver attention for longer periods than the distractions that have long been with us. There is particular concern about the potential detrimental effects of distraction among adolescent drivers because of their relative lack of driving experience in combination with the tendency to be early adopters of technology.

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Driver distractions can include physical tasks (e.g., eating, drinking, or manipulating dashboard controls), auditory or visual diversions (e.g., loud music or looking at a smartphone screen), or cognitive activities (e.g., talking on a phone or to a passenger). Some activities can incorporate all three modes of distraction. Sending a text message, for example, typically results in physical, visual, and cognitive distraction simultaneously. The potential for a particular form of distraction to increase crash risk depends on a number of factors. These include (1) the immediate degradation of driving competence posed by a distracted behavior; (2) the frequency with which the distraction occurs; and (3) the duration of the distracted behavior. Although reaching for a moving object in a vehicle entails a high degree of risk, such an action is relatively rare and generally of brief duration [2]. In contrast, a phone conversation involves less acute risk, but drivers may make several calls during a trip, and each can last several minutes—although most calls are brief [3]. Consequently, the attributable risk (population attributable fraction [4]) of driver cell phone use to crashes can be quite high, whereas the aggregate crash risk attributable to reaching for objects, waving at invading bees, or reacting to spilled coffee is far lower, despite the attendant high—but momentary—risks of doing so.

The driving context within which distractions occur is important as well. Having a phone conversation in busy traffic or on a narrow winding road likely increases crash risk more than engaging in the same conversation in light traffic or on a straight stretch of road. Drivers do attempt to minimize risks by selecting "safer" moments to engage in potentially distracting activities [5–7]. However, these efforts can only be partially effective. Individuals may underestimate the risks of distracted activities and may not fully realize when their driving is degraded [8–10]. Moreover, situations in which highly focused attention is required can appear unexpectedly (e.g., an object falls from a vehicle ahead). Precise measures of the incidence and duration of distracted driving behaviors are needed to estimate the chances drivers will fail to notice such rare events—or have insufficient time to react—when they occur.

Measuring the prevalence of distracted driving

Until recently, there has been no way to measure driver distraction with the precision necessary for productive scientific inquiry. Unlike the case with alcohol-induced impairment, there is no objective way to retrospectively measure a driver's degree of impairment by distraction at the time of a crash. Several studies have obtained self-reports of distracted driving behaviors, but such data are rarely specific enough to be of any research value. Drivers cannot accurately report how often, how long, or during what proportion of their driving, they engage in distracted behaviors. Nor can they report on cognitive distractions about which they have little or no awareness. Observational techniques have been used to measure distraction [11–14], but these are also severely limited. Most driver behaviors can be difficult for observers to see. Consequently, observations are generally conducted only in the daytime and usually when vehicles are stopped (although "distracted" behavior is known to be greater when vehicles are stopped [3,8]). Finally, cognitive distraction cannot be reliably observed in field driving conditions, nor can distracting conditions be identified or measured from fixed locations.

Fortunately, even as they have created more potential distractions, technologic advances have also enabled better measurement of distracted driving. Installation of unobtrusive cameras and other recording equipments inside vehicles has enabled researchers to directly observe driver behavior far more precisely and validly than ever before, to link measures of driver behavior with information about the driving context and to quantify these with substantial precision [3,8,15–18].

Distracted driving among adolescents

Concern about distraction among adolescent drivers has led to enactment of laws in most states prohibiting young drivers from using EDs [19] despite a paucity of evidence about the incidence or riskiness of this behavior. Nonetheless, there are legitimate reasons for concern. Adolescents tend to be early adopters and aggressive users of new technologies that can be quite distracting [20]. Driving is less automated for novices, requiring more of their attentional capacity than is the case for experienced drivers [21]. Additionally, areas of the brain involved in regulatory competence, forming judgments, and decision making—all of which are important functions in driving—are not fully developed among adolescents [22]. Accordingly, novice adolescent drivers may have greater difficulty than experienced adult drivers in managing potentially distracting conditions, rendering them more susceptible to a distraction-related crash [21].

Cell phone use among adolescent drivers has received some research attention. Observational and self-report surveys indicate that many adolescents use a phone at least occasionally while driving [7,23–25]. About a quarter of high-school age drivers report they "often" read text messages while driving, but they are far less likely to initiate texts than to read them [7]. The potential for passengers to distract a driver has also received some attention. Sixteen- and 17-year-old drivers tend to carry more passengers and do so more often, than older adolescents and adults, increasing the exposure of young and inexperienced drivers to distractions that passengers may create [26,27].

The distractions of greatest concern for adolescent drivers—passengers and phone use—appear to be inversely related. In a large observational study of young drivers departing from high schools, we found cell phone use was twice as common among drivers who were alone as among those with passengers [24]. And in a notable deviation from the greater tendency of males to engage in most risky behaviors, females were 70% more likely to be observed talking on a phone.

Despite the substantial concern about distracted driving among adolescents, almost no research has examined the many potential distractions often believed to be common and problematic for adolescent drivers, beyond those involving passengers and cell phone use. To address that gap, we used data collected in a naturalistic driving study of 16- to 18-year-old drivers in North Carolina to document the frequency of several distracted driving behaviors. We also examined the association of distractions with drivers' sex and gaze direction (toward or away from the road), number and characteristics of passengers as well as time of day. In addition, we looked at the association of distraction with the occurrence of critical events.

Methods

Data source

We used data collected during an earlier, naturalistic study of adolescent driving behavior [15]. Event-based data recorders were originally placed in participants' vehicles during the initial 4 months of the learner license period to observe parent and