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The observed effects of teenage passengers on the risky driving behavior of teenage drivers

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Abstract

The association between teenage passengers and crash risks among young drivers may be due to risky driving behavior. We investigated the effect on two measures of risky driving in the presence of young male and female passengers. Vehicles exiting from parking lots at 10 high schools were observed and the occupants were identified by gender and age (teen or adult). At a nearby site, the speed and headway of passing traffic were recorded using video and LIDAR technology. Teenage drivers drove faster than the general traffic and allowed shorter headways, particularly in the presence of a male teenage passenger. Both male and female teenage drivers allowed shorter headways (relative to no passenger or a female passenger) in the presence of a male teenage passenger, while the presence of a female teenage passenger resulted in longer headways for male teenage drivers. Overall, the observed rate of high risk driving (defined as speed $\geq$15 mph or more above the posted speed limit and/or headway of $\leq$1.0 s) for the teen male driver/male passenger condition was about double that of general traffic. In conclusion, the presence of male teenage passengers was associated with risky driving behavior among teenage drivers.
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1. Introduction

Crash involvement rates per mile driven are several times greater for teenage than that for middle-age drivers (NHTSA, 2000). Fatal and non-fatal crash rates for 16- or 17-year-old drivers are particularly elevated in the presence of teen passengers (Chen et al., 2000; Doherty et al., 1998; Preusser et al., 1998; Regan and Mitsopoulos, 2001; Ulmer et al., 1997; Williams and Ferguson, 2002), particularly for speed-related fatal crashes (Williams, 2001). While the increased risk of teen passengers on crash rates among teen drivers is well documented, the underlying reasons that teen passengers increase teen driving risk are not well understood. One possibility is that the presence of teen passengers may alter teenage driving behavior.

Teen passengers may cause actual distraction by their actions in the vehicle, such as talking, altering the radio or CD player, moving about, or touching the driver. In studies of adolescent risk behaviors, it is indicated that teens are an important source of social influence (Ennett and Bauman, 1994; Jaccard et al., 2005; Simons-Morton et al., 2004) and peer influence may also be a factor in driving. Peer influences may include direct and intentional encouragement of risky driving behavior, for example, by urging the driver to drive fast, catch up with, or pass another vehicle. Peer influences may also be indirect and unintended. Accordingly, a teenage driver may be inclined to drive in a more or less aggressive, risky, or careless way because he or she perceives that the teen passenger(s) would view such driving behavior as desirable or expected. Although it is clear that the presence of teenage passengers is an independent risk factor for crashes among teenage drivers

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this relationship could be due in part to time of day, trip location and purpose, alcohol use, or other factor common to both teenage passengers and crashes by teenage drivers (Doherty et al., 1998). Although there has been considerable study of the statistical association between passenger characteristics and teenage driver crash risk, there has been relatively little research on the effects of passengers on teenage driver behavior and only one study has been reported in which an effect of passengers on young driver behavior was actually observed.

McKenna et al. (1998) provided the only data so far reported on the observed effect of young passengers on the driving behavior of young drivers in a natural driving environment. Specifically, McKenna et al. conducted a set of observational studies to assess the effects of young passenger presence on young driver behaviors, including speed, following distance, and gap acceptance. Accordingly, relative to young drivers with no young passenger, mean speed was greater for both male and female drivers when a male passenger was present. However, with a female passenger present, mean speed was greater for male drivers, but not female drivers. Gap distance was less for both young male and female drivers in the presence of young male passengers and greater in the presence of a young female passenger. Overall, McKenna et al. provided the first data showing that in the presence of male young passengers, risky driving behavior was greater for both young male and young female drivers, while in the presence of young female passengers, risky driving among young male drivers was less.

The study by McKenna et al., however, was limited in several ways. Importantly, determinations of driver and passenger age were based on the judgment of a remote, hidden observer viewing into a moving vehicle that they were less than 25 or greater than 25 years of age. In pilot efforts related to the present project, observers were unable to confidently classify passengers according to age and sex using both direct observation and video recordings from distances as close as 15 ft from moving vehicles. Windshield glare, shadows, tinted windows, varying vehicle heights and configurations, and other variable real-world conditions prevented observers from making confident judgments about occupant age and sex in moving vehicles. We concluded that only proximal observation of occupants in stationery vehicles would provide accurate assessments. The "gap acceptance" experiment of McKenna et al. might also be improved upon. For McKenna, gap acceptance was recorded as vehicles were turning from a "junction, which gave access to a 30 mph urban road." The time that the merging vehicle's rear bumper reached a criterion point on the main road and the time the following vehicle's front bumper reached the criterion point were recorded, and the time between vehicles was considered the "gap" that the driver accepted. Actually, the gap (available time to make the maneuver) is not known. The measure is really a safety clearance interval that reflects both gap size and the speed with which the driver completed the merging maneuver. Finally, the study was conducted in England, where drivers are licensed at older ages and may in other ways be different from drivers in the United States.

The purpose of the present study was to examine driving behavior of teenage drivers in the presence of teenage passengers. Vehicles were observed exiting from high school parking lots at dismissal time and an observer was stationed within a few yards of the exit such that he or she could easily determine the number, sex, and relative age of the passengers. Complete information (presence, age, gender) for all vehicle occupants was recorded for more than 97% of vehicles exiting the lots and partial information (age or gender unknown, rear seat passenger presence unknown) was recorded for more than 99% of vehicles. In this way, the study was able to capture a large number of drivers with very high confidence that those who appeared to be youthful were indeed teenagers. Vehicle speeds and headways were then recorded at nearby locations, where roadway conditions allowed meaningful opportunities for speeding or tailgating. Vehicles at these measurement sites were then matched with information about the vehicles previously obtained as they exited the school lot. The behavior of teenage drivers could then be compared with the behavior of general traffic, and the effects of passenger presence could be assessed. The experiment provides an opportunity to confirm the passenger effects on risky driving behavior observed by McKenna et al. (1998) with a US population of high school students.

2. Method

2.1. Design

Field observations of vehicle traffic in the vicinity of public high schools were conducted and data on speed and frontal headway were obtained from relatively unobtrusive roadside recording equipment. Observers standing within a few feet of the exit from each school parking lot recorded the descriptions of exiting vehicles and the characteristics (age, sex) of drivers and passengers. At a site some distance from the school (½ to 3/4 mile), passing traffic was assessed using a roadside recording system, including a video camcorder and LIDAR. LIDAR is a laser device that measures the speed of vehicles and their distance and is commonly used in police speed enforcement. The manufacturer-certified accuracy of the system used in this study is ±1 mph for speed and ±1 ft for distance. From this recording, the speed and headway (distance from front of preceding vehicle to front of target vehicle) of each vehicle could be derived. By matching the vehicle information from the school exit to the vehicles recorded on the roadway, each vehicle could be categorized as having a teenage driver, an adult driver, or as "general traffic" (not from the school). These data permit an analysis of two measures of risky or aggressive driving – speed and headway – as a function of driver and passenger characteristics.

Data were collected at 13 roadway sites in the vicinity of 10 different public schools (two different sites meeting