



ELSEVIER

www.elsevier.com/locate/jsr

Journal of Safety Research 39 (2008) 437–443



www.nsc.org

Passenger distractions among adolescent drivers

Katherine E. Heck *, Ramona M. Carlos

Department of Human and Community Development, 4-H Center for Youth Development, University of California, Davis, 1 Shields Ave., Davis, CA 95616, USA

Available online 8 August 2008

Abstract

Problem: Adolescents who drive with peers are known to have a higher risk of crashes. While passengers may distract drivers, little is known about the circumstances of these distractions among teen drivers. *Method:* This study used survey data on driving among 2,144 California high school seniors to examine distractions caused by passengers. *Results:* Overall, 38.4% of youths who drove reported having been distracted by a passenger. Distractions were more commonly reported among girls and students attending moderate- to high-income schools. Talking or yelling was the most commonly reported type of distraction. About 7.5% of distractions reported were deliberate, such as hitting or tickling the driver or attempting to use the vehicle's controls. Driving after alcohol use and having had a crash as a driver were both significant predictors of reporting passenger-related distraction. *Conclusion:* Adolescents often experience distractions related to passengers, and in some cases these distractions are intentional. *Impact on industry:* These results provide information about teenage drivers who are distracted by passenger behaviors. In some cases, passengers attempted to use vehicle controls; however, it seems unlikely that this behavior is common enough to warrant redesign of controls to make them less accessible to passengers.

© 2008 National Safety Council and Elsevier Ltd. All rights reserved.

Keywords: Adolescent; Motor vehicles; Distraction; Social behavior

1. Problem

Many studies have indicated that when adolescent drivers have teenage passengers, they have a higher risk of crashes. This observation is behind the decision of a number of U.S. states as well as New Zealand, Australia, and other nations to implement graduated driver licensing laws that prevent novice drivers from transporting young passengers during the first 6 to 12 months of their driving (Williams, 2007). Evaluation research suggests that restrictions on teen drivers carrying passengers have resulted in reductions in crash fatalities in California and elsewhere (Begg & Stephenson, 2003; Chen, Baker, & Li, 2006; Cooper, Atkins, & Gillen, 2005; Masten & Hage, 2004; Zwicker, Williams, Chaudhary, & Farmer, 2006).

Numerous analyses of Fatality Analysis Reporting System data as well as other data sources have found higher crash risks

among teenagers who have other teenagers as passengers (Chen, Baker, Braver, & Li, 2000; Preusser, Ferguson, & Williams, 1998; Williams, 2001; Williams & Ferguson, 2002). A review of fatal crashes involving 16 and 17 year old drivers who did not have an adult in the car with them found that over half (55%) had a passenger younger than age 20 (Williams & Ferguson, 2002). In 2000, 63% of the deaths of 13-19 year old passengers occurred when other teenagers were driving (Williams, 2001). Teenage drivers who had two or more teenage passengers were at particularly high risk of fatal crashes (Preusser et al., 1998). Carrying young male passengers appears to carry a particularly high risk (Chen et al., 2000). In addition, new research suggests that young non-sibling passengers of teenage drivers are at higher risk of injury than the drivers' siblings, most likely due to lesser seatbelt use among non-sibling teenage passengers (Senserrick, Kallan, & Winston, 2007).

Driver distraction, the likely reason for the association between young passengers and crash risk, has been identified as a key cause of accidents for adults (Stutts et al., 2003).

* Corresponding author. Tel.: +1 530 754 8755; fax: +1 530 754 8440.

E-mail address: keheck@ucdavis.edu (K.E. Heck).

Distraction results from a variety of sources, and explains approximately one-fourth of all accidents in the United States (Young, Regan, & Hammer, 2003). Distractions may result from driver behaviors such as eating, drinking, or changing the radio station; general inattention or daydreaming; or from interactions with passengers (Stutts et al., 2003). A recent topic of concern is cellular phone use, which has been identified as a risk factor for accidents among drivers of all ages and has been regulated in some states (e.g., McCartt, Hellinga, & Bratiman, 2006).

The excess risk attributable to passengers appears to be specific to the teenage years. In one study comparing drivers ages 16–19 to those in their 20s, the teenage drivers, but not the drivers in their 20s, experienced higher crash rates when they carried passengers (Doherty, Andrey, & MacGregor, 1998). In addition and in contrast to the excess risk seen with carrying teenage passengers, carrying older passengers is associated with a reduction in crash risk (Aldridge, Himmler, Aultman-Hall, & Stamatiadis, 1999). In survey data, adolescents have reported peer passengers as a risk factor for dangerous driving: a survey of teenage drivers found that when asked about their most dangerous driving situation in the past 6 months, 85% cited events involving peers in the vehicle (Farrow, 1987). An observational study of teen drivers leaving high schools found that the presence of male passengers was associated with a reduced headway space (i.e., the space between the driver's car and the car in front; Simons-Morton, Lerner, & Singer, 2005). In contrast, the presence of young females has been associated with less risky driving (Simons-Morton et al., 2005; Williams, Ferguson, & McCartt, 2007).

What is behind the higher crash risk of teenagers who carry young passengers? In addition to their lesser experience, there are physiological reasons associated with brain development that help to explain why adolescents are at greater risk of traffic accidents. Recent studies have found that brain development continues through adolescence and beyond, although not as dramatically as in earlier periods, particularly with regard to the brain circuitry supporting cognitively controlled behavior (Luna & Sweeney, 2004). Keating (2007) divides adolescent development relevant to driving into several domains, and evaluates the potential of each one as a contributor to high-risk driving. The development of cognitive capacity appears to be less of a factor in high-risk driving than some other areas of development, although adolescents' capacity for accurate judgment of risk may play a role. The development of expertise, critical in driving safety, is time-intensive and involves much practice. Adolescents as well as novice adult drivers learn from their errors and receive continual feedback as they progress in their driving, and gradually learn to automatize the processes involved in safe driving (Keating, 2007).

The ability to function under challenging circumstances and to manage risk is also known as regulatory competence, and involves the prefrontal cortex, which is growing rapidly during the adolescent period (Keating, 2007). The development of regulatory competence allows for integrative functioning, in which adolescents can accomplish a task despite major distractions, such as driving with distracting actions of passengers in the car. Distraction from a task involves a disruption to ongoing brain

processes. Such distractions can result in poor attention and planning, difficulty generating and implementing strategies, inability to utilize feedback, and inflexibility of thinking (Anderson, Anderson, Northam, Jacobs, & Catroppa, 2001), all of which may lead to car crashes. The cognitive processes required for attention include orienting to sensory events, detecting signals for conscious processing, and maintaining a vigilant or alert state (Posner & Petersen, 1990). Processing competing signals – attempting to focus attention visually while also receiving unrelated auditory signals (e.g., listening to a passenger talking) – can slow the ability to react to visual cues (Lavie, 2005; Posner & Petersen, 1990). Brain functions guiding the ability to maintain attention; cognitive flexibility, including memory and shift in attention; and planning, goal setting, and executing strategic behavior all are controlled in the prefrontal cortex of the brain, which is one of the last of the brain regions to mature (Casey, Giedd, & Thomas, 2000; Hamilton, 1983; Kelley, Schochet, & Landry, 2004; Rosso, Young, Femia, & Yurgelun-Todd, 2004). Because of their less developed brain functions, adolescents are developmentally less able than adults to cope effectively with distractions during driving.

Regulatory control, also developing in adolescence, includes the ability to regulate emotion and attention (Keating, 2007). With maturation of brain functioning comes an improved ability to identify, express, and manage emotions (Rosso et al., 2004). The development of brain pathways is considered critical for controlling emotional expressions; the less developed pathways of adolescents may explain why they are more likely to exhibit risky behavior. Sensation seeking, one component of emotional management, is a normative aspect of adolescent development (Leslie et al., 2004).

Risk taking during adolescence is the product of an interaction between heightened stimulation seeking and an immature self-regulatory system that is not yet able to control impulses (Steinberg, 2004). Psychosocial and affective factors influence adolescent behavior. For example, adolescents are particularly susceptible to peer influence. They tend not to have a future orientation (i.e., they are generally more oriented to the present than to the future). Finally, adolescents tend to have higher levels of emotional arousal (Steinberg, 2004). All of these are related to the influence of passengers on teen driving.

Most critical to this research project, social relationships with peers and parents, as well as influences by culture and the media, play an important role in adolescent driving risk (Keating, 2007). Peers are of particular importance in the adolescent period, and their norms on safe or high-risk driving are likely to have an influence on the adolescent driver. Driving with peers is a highly desirable activity for 16- and 17-year-olds, affording them status, peer approval, and independence (Arnett, 2002). In addition to the influence of peers, parents play an important role in adolescents' successful transition to safe driving, via expectations of compliance to driving laws and general norms of safe driving. However, while parents often put restrictions on teenagers regarding their driving, they often do not appreciate the danger involved in driving with peers, and they find it difficult to enforce driving rules and restrictions (Williams et al., 2007).

While it is well known that young drivers who carry young passengers are at particularly high risk of crashes, little research has examined exactly what interactions between driver and passenger occur to create a distracting situation for the teenage driver. This study used a survey of high school seniors to examine what distractions young drivers reported having experienced due to passengers in their cars. The first component of the study was an exploratory analysis of the open-ended data to examine what types of passenger-associated distractions students reported. We then analyzed the relationships between reported distractions and other driving behaviors. The primary hypothesis of the analytical component of this study was that students who reported driving with friends in the car would be more likely than other students to report experiencing distractions. In addition, we hypothesized that students who reported that they had been distracted by a passenger while driving would be more likely than other students to report having had a crash.

2. Method

To examine various aspects of teenage driving and driver education, 2,144 high school seniors from 13 high schools around California were surveyed during the spring and fall of 2006. Students filled out a four page written survey, primarily consisting of multiple choice responses but also including some open-ended questions. The survey was developed using results from several focus groups with teens in two of the schools asking about their driving and driver education experiences. Surveys were taken in class on a single day, and thus excluded students who were absent that day. The classes in which the surveys were given were English classes, which all students were required to take. Overall, the sample included approximately 68% of enrolled seniors at the schools.

The schools in the sample varied widely in size and ethnic composition. Twelve of the schools were comprehensive public high schools, and one was a private parochial school. The schools were located in seven counties ranging from the Central Valley to Los Angeles County. Schools were classified as being rural (located in a town or Census Designated Place of fewer than 10,000 population), in a suburb or town (schools in areas with a population of 10,000 to 74,999), or urban (schools in cities of 75,000 or more). Overall, 19% of the students in this sample attended high schools in rural areas (five schools), 49% attended high schools in suburbs or towns (four schools), and about 32% attended urban high schools (four schools).

Schools were classified by income level based on California Department of Education data on the proportion of students who received free or reduced-price meals. Three schools, including the private school and two others, were classified as higher-income schools; in these schools, fewer than 20% of students received free or reduced-price meals. The six schools classified as moderate-income had between 20% and 49% of their students receiving free or reduced-price meals. The remaining four lower-income schools had more than 50% of students receiving free or reduced-price meals.

Distraction while driving was measured by asking the respondents whether they had been distracted while driving by

things passengers had done. Those who said yes were asked, in an open-ended question, what caused the distraction. Their responses were then coded into several categories. Youths who did not drive did not answer the questions about driving, including the distraction questions, so are excluded from distraction analyses.

Logistic regression analysis was used to examine predictors of reporting being distracted by a passenger. A variety of variables were considered for inclusion in the model. These included demographics (race/ethnicity, gender, location of the school, and income level of the school) as well as high-risk driving-related experiences (driving after alcohol use, driving after drug use, having had a crash as a driver, having been a passenger when a friend was driving dangerously, and driving with friends in the car). The relationship of these variables to reporting a distraction was first examined in unadjusted analyses and then combined in a multivariable logistic regression model. The adjusted model included all potential confounders included in the bivariate models.

Data were managed in SAS (2004) and analyses were completed using SUDAAN (Research Triangle Institute, 2001) to adjust for the cluster sample. Students were sampled within schools; treating a cluster sample design in analysis as though it were a simple random sample has the potential to create erroneous results. SUDAAN adjusts for the cluster sample method to provide the correct standard errors.

3. Results

The sample of surveyed youths is described in Table 1. The racial/ethnic composition of youths in this survey was similar in most respects to the composition of California high school seniors as a whole.

A total of 1,715 youths in this study said that they drove, with or without a license. The remainder of surveyed youths (n=429, 20.0%) were excluded from analyses about distraction while driving.

Overall, 38.4% of young drivers in this survey (n=623) reported that they had been distracted while driving by one or

Table 1
Survey sample compared with all California high school seniors

Characteristic	Study sample	California seniors*
Race/ethnicity	(n=2,144)	(n=423,289)
Hispanic/Latino	34.2	39.0
<i>Non-Hispanic:</i>		
White	42.0	37.0
Asian	8.6	9.9
Pacific Islander†	3.1	3.7
African American	5.8	8.0
Native American	2.7	0.9
Male	46.1	50.4
Female	53.9	49.6

*Enrollment figures from California Department of Education (CDE) for 2005-06 school year. Our survey was taken during the 2005-06 and 2006-07 school years. Values are percentages.

†CDE figures separate Pacific Islander and Filipino, so they have been combined here as "Pacific Islander."

§9 percent of the study sample were missing race/ethnicity information, and 4.6 percent reported more than one race group.

more of their passengers. Table 2 shows demographic breakdowns of which students reported being distracted. Females were slightly more likely than males to report being distracted; this difference was marginally statistically significant ($p=.0523$). There were no significant differences across racial or ethnic groups or urban, rural, or suburban schools in the percent of youths who reported distractions. However, students at lower-income schools were significantly less likely to report passenger-related distractions than those who attended moderate or upper-income schools ($p=.0002$ across the three groups).

Table 3 shows the reasons youths reported for why they were distracted. The most commonly reported type of distraction was that a passenger was talking, yelling, arguing, or being loud (almost 45%). More than 22% of students who reported distraction said that they were distracted by passengers “fooling around,” “messing around,” “horsing around,” or “being stupid.” Also included in this category were reported activities such as “wrestling” or “throw[ing] things out the window at others.” Among drivers reporting distraction, about 16% reported being distracted due to passengers playing music, dancing, or changing the CD or radio stations. About 3% reported accidental distractions such as “spilled drinks in my car,” “my dog kept jumping on me,” or “put my car into neutral (on accident).”

About 7.5% of students reported their passengers intentionally distracting them. These included responses such as “punched me in the head,” “tickle me,” “hit me in the face,” “people squirting guns at me,” “throw stuff at me,” “throw a cup of water in my face,” or “poking me.” Also included in this “deliberate” category were many responses involving passenger attempts to use the vehicle’s controls. Some examples were “trying to control the car/pressing buttons,” “they grab your clutch,” “tried to get me to crash,” “mess around with mirrors,” “pull the E-brake,” “try to take the wheel,” “messed with my

Table 2
Description of driving respondents according to whether they were distracted by a passenger

Characteristic	Percent who were distracted	p-value for difference
<i>Sex</i>		
Male	36.1	.0523
Female	40.9	
<i>Race/ethnicity</i>		
Latino	38.3	.6105
White, non-Hispanic	40.5	
Asian/Pacific Islander	34.3	
African American	36.6	
Native American	34.9	
<i>School location</i>		
Rural	36.5	.0859
Suburb or town	41.0	
Urban	35.3	
<i>School income level</i>		
Lower income	29.6	.0002
Moderate income	40.7	
Higher income	41.2	

Table 3
Reported distractions

Type of distraction	Among those distracted, percent reporting this distraction
Talking, yelling	44.7
Fooling around	22.4
Music, dancing	15.5
Pointing something out, showing something	7.7
Deliberate distractions	7.5
Accidental distractions	2.7
Other reasons	18.6

seat adjustments,” “turning on car lights,” or “messaging with things in the car such as radio or hazard lights.”

A number of miscellaneous responses were coded “other,” many of which were references to drug use and sexual behavior. A notable “other” response made by some students was “ghost riding the whip;” this phrase describes a driver who gets out of the vehicle and rides on top while the car continues to drive slowly down the street, and was made popular in a 2006 hit song by a San Francisco Bay Area hip-hop musician. While “ghost riding” typically involves a driver, since the question asked about passenger distractions, in this case the passenger may have been the ghost rider.

While this survey did not ask who the distracting passenger was, some students identified the passenger in the text responses describing the distraction. Of those who did identify the individual who had distracted them, most said either that it was a friend or a sibling, indicating the preponderance of similar-aged youths among the passengers who create

Table 4
Logistic regression results predicting reporting a distraction: Unadjusted

Predictor	p-value	Odds ratio	95% Confidence Interval
<i>Demographics</i>			
<i>Race/ethnicity</i>			
Latino	.4493	0.91	0.72-1.15
African American	.4959	0.85	0.53-1.36
Asian/Pacific Islander	.1599	0.77	0.53-1.11
Native American	.4683	0.79	0.41-1.50
(reference: white)		1.00	
Male	.0529	0.82	0.67-1.00
<i>Driving or passenger behaviors</i>			
Attends a school in a rural area	.7390	1.05	0.79-1.40
Attends school in a suburb or town	.0402	1.28	1.01-1.61
(reference: urban)		1.00	
Attends a higher-income school	.0003	1.67	1.27-2.19
Attends a moderate-income school	.0005	1.63	1.24-2.15
(reference: low-income school)		1.00	
Reported driving after alcohol use	<.0001	2.48	1.91-3.22
Reported driving after drug use	<.0001	2.13	1.61-2.81
Reported having had a crash as a driver	<.0001	1.81	1.42-2.32
Been a passenger when a friend was driving dangerously	.0194	1.28	1.04-1.57
Drives with friends in the car	.0001	1.77	1.32-2.36

distractions for young drivers. However, in some cases they named parents as the passenger who distracted them, such as their mothers or fathers talking, joking, lecturing, arguing with or yelling at them. A very few cases of reported deliberate driver distraction involved parents, such as “put ice down my shirt (it was my mom).”

Tables 4 and 5 show unadjusted and adjusted logistic regression results predicting reporting a distraction while driving. In both unadjusted and adjusted results, there were no significant differences among racial and ethnic groups in the likelihood of reporting a distraction. However, some demographic variables were significant predictors of passenger-related distractions.

In adjusted results, boys were significantly less likely than girls to report distractions. There were no significant differences after adjustment in reports of distractions by rural, suburban, or urban school attendance. However, students attending a moderate-income or higher-income school had approximately 45% greater odds of reporting distraction compared with students attending a lower-income school; in both cases the results by income were close to the .05 significance level. All driving-related variables were significant predictors before adjustment; however, after adjustment, only some were statistically significant. In the adjusted model, the strongest predictor of reporting being distracted by a passenger was reporting driving after alcohol use ($p=.0003$). In addition, in the adjusted model, youths who reported having had a crash as a driver continued to be more likely than youths who had not had a crash to say they had been distracted as a driver. Drug use and driving was marginally nonsignificant as a predictor of distraction after adjustment ($p=.0743$). Having been a passenger when a friend was driving dangerously, which was included in models because of the possibility that having ridden with friends in a high-risk situation

might be closely related to passenger-related distractions, was no longer significant after adjustment for other factors.

4. Discussion

This study provided new information about what types of distractions youths encounter from other passengers when driving. Very little previous research exists to examine how passengers distract drivers (Young et al., 2003). For adolescents, conversing with friends in the car may be distracting, but peers may also create more dangerous situations intentionally because they find it exciting or humorous. Results from this study supported the idea that adolescent passengers frequently encourage or create dangerous situations for the driver. In addition to unintentional distractions resulting from talking or changing the radio, a significant number of respondents reported that their passengers had deliberately attempted to distract them or had created a distracting situation by “fooling around.”

Youths who reported being distracted as a driver were also more likely than other youths to report having driven after drinking, having had a crash, and having ridden with a dangerous driver. These findings provide further data to suggest that high risk youth driving behaviors tend to cluster, much as other types of youth risk behaviors, such as substance use and sexual behaviors, cluster together (e.g., DuRant, Smith, Kreiter, & Krowchuk, 1999; Hallfors et al., 2004). It seems not unlikely that some of the peers who were the drivers in the dangerous situations the respondent remembered may have been the same passengers who caused the distraction for the respondents.

Most students in this survey (59%) reported having been a passenger when a friend was driving dangerously. These students were more likely than other respondents to report having been distracted by passengers in the car when driving. Whether or not the dangerous driver or drivers were the same individuals who distracted the respondent is not possible to know from these data; however, it seems possible that those who are willing to drive dangerously may have fewer inhibitions about distracting the driver than those who do not. Nevertheless, those who had been a passenger with a dangerous driver were not statistically significantly more likely to report intentional distractions (or other specific types of distractions) than those who did not report having been a passenger of a dangerous driver (data not shown). Numbers for adequate analysis were relatively small, however; 47 students reported deliberate distractions, and 37 of them reported having been in a car with a friend who was driving dangerously.

The distractions teens reported experiencing in some ways paralleled the results in a AAA Foundation video analysis of driver distraction for adults ages 18 and older (Stutts et al., 2003). Similar to the results found here, in the AAA study, “conversing” was the most commonly identified distraction, occurring during 15% of driving time; manipulating music controls (specifically the driver, rather than passengers as identified in this study) occupied about 1% of driving time. Also commonly reported in that survey were additional activities specific to the driver that would not have been captured by this survey: eating, drinking, spilling, reaching,

Table 5
Adjusted logistic regression results predicting reporting a distraction

Predictor	p-value	Odds ratio	95% Confidence Interval
<i>Demographics</i>			
<i>Race/ethnicity</i>			
Latino	.2748	1.17	0.89-1.54
African American	.4971	1.20	0.71-2.04
Asian/Pacific Islander	.8401	1.04	0.69-1.58
Native American (reference: white)	.5451	0.81	0.41-1.60
Male	.0048	0.71	0.56-0.90
Attends a school in a rural area	.7412	0.94	0.67-1.32
Attends school in a suburb or town (reference: urban)	.8195	1.04	0.77-1.40
Attends a higher-income school	.0577	1.44	0.99-2.10
Attends a moderate-income school (reference: low-income school)	.0413	1.47	1.02-2.12
<i>Driving or passenger behaviors</i>			
Reported driving after alcohol use	.0003	1.93	1.36-2.75
Reported driving after drug use	.0743	1.41	0.97-2.06
Reported having had a crash as a driver	.0056	1.46	1.12-1.90
Been a passenger when a friend was driving dangerously	.1562	1.18	0.94-1.47
Drives with friends in the car	.0991	1.31	0.95-1.82

leaning over, and so forth. A notable difference between their study of adults and this study of teenagers was that passengers “fooling around” or deliberately distracting the driver were not found to be a major hazard in the study of adults. Less than 1% of driving time in the AAA study was taken up with passengers distracting the driver, and in many cases these passengers were infants or young children.

The sample of high school seniors at 13 schools included in this study, while demographically similar to the population of seniors at public high schools throughout California, was a limitation of the study. It was not a random and representative sample of all California high school seniors. Bay Area and far northern and southern California counties were not included in the sample. In addition, students who drop out prior to their senior year are not included in the sample and they may have a risk of distraction that differs from that of enrolled students. Thus, the results are not necessarily representative of all young drivers in California.

5. Summary

A substantial number of teen drivers in this survey reported being distracted by passengers, and in most cases their peers were the source of the distraction. The relatively high prevalence of peer passengers who either deliberately attempted to distract or bother the driver, or who “fooled around” in ways that either intentionally or unintentionally distracted the driver, was a disquieting finding. Further research could attempt to more accurately quantify the frequency and types of these types of distractions for teenagers, since there was likely overlap between the nonspecific “fooling around” responses and the more specific deliberate distractions reported, as well as accurately quantifying the sources of the distractions (whether from peers, siblings, older family members, or other passengers). It is possible that new driver education programming could be developed specific to passenger distraction that might be able to reduce the frequency of peer distractions. However, cognitive psychology would suggest that high-risk passenger behavior may be a developmental norm that education might have a difficult time combating (Steinberg, 2004). The results of this study provide further support for peer passenger restrictions under graduated driver licensing laws. Relatively few students reported that their parents restricted friends from riding in the car. Providing better information to parents about the risks associated with teen passengers, and encouraging parents to enforce the graduated driver licensing laws regarding passenger restrictions, could also help to reduce the frequency of peer passengers creating distractions for teen drivers.

References

Aldridge, B., Himmler, M., Aultman-Hall, L., & Stamatiadis, N. (1999). Impact of passengers on young driver safety. *Transportation Research Record*, 1693, 25–30 (Paper no. 99-0710).

Anderson, V. A., Anderson, P., Northam, E., Jacobs, R., & Catroppa, C. (2001). Development of executive functions through late childhood and adolescence in an Australian sample. *Developmental Neuropsychology*, 20(1), 385–406.

Arnett, J. J. (2002). Developmental sources of crash risk in young drivers. *Injury Prevention*, 8(Suppl. II), ii17–ii23.

Begg, D., & Stephenson, S. (2003). Graduated driver licensing: The New Zealand experience. *Journal of Safety Research*, 34, 99–105.

Casey, B. J., Giedd, J. N., & Thomas, K. M. (2000). Structural and functional brain development and its relation to cognitive development. *Biological Psychology*, 54, 241–257.

Chen, L. H., Baker, S. P., Braver, E. R., & Li, G. (2000). Carrying passengers as a risk factor for crashes fatal to 16- and 17-year-old drivers. *JAMA*, 283, 1578–1582.

Chen, L. H., Baker, S. P., & Li, G. (2006). Graduated driver licensing programs and fatal crashes of 16-year-old drivers: A national evaluation. *Pediatrics*, 118(1), 56–62.

Cooper, D., Atkins, F., & Gillen, D. (2005). Measuring the impact of the passenger restriction on new teenage drivers. *Accident Analysis and Prevention*, 37, 19–23.

Doherty, S. T., Andrey, J. C., & MacGregor, C. (1998). The situational risks of young drivers: The influence of passengers, time of day and day of week on accident rates. *Accident Analysis and Prevention*, 30(1), 45–52.

DuRant, R. H., Smith, J. A., Kreiter, S. R., & Krowchuk, D. P. (1999). The relationship between early age of onset of initial substance use and engaging in multiple risk behaviors among young adolescents. *Archives of Pediatric and Adolescent Medicine*, 153, 286–291.

Farrow, J. A. (1987). Young driver risk taking: A description of dangerous driving situations among 16- to 19-year-old drivers. *International Journal of the Addictions*, 22, 1255–1267.

Hallfors, D. D., Waller, M. W., Ford, C. A., Halpern, C. T., Brodish, P. H., & Iritani, B. (2004). Adolescent depression and suicide risk: Association with sex and drug behavior. *American Journal of Preventive Medicine*, 27(3), 224–231.

Hamilton, J. A. (1983). Development of interest and enjoyment in adolescence. Part I. Attentional capacities. *Journal of Youth and Adolescence*, 12(5), 355–362.

Keating, D. P. (2007). Understanding adolescent development: Implications for driving safety. *Journal of Safety Research*, 38, 147–157.

Kelley, A. E., Schochet, T., & Landry, C. F. (2004). Risk taking and novelty seeking in adolescence. Introduction to Part I. *Annals of New York Academy of Sciences*, 1021, 27–32.

Lavie, N. (2005). Distracted and confused? Selective attention under load. *Trends in Cognitive Sciences*, 9(2), 75–82.

Leslie, F. M., Loughlin, S. E., Wang, R., Perez, L., Lotfipour, S., & Belluzia, J. D. (2004). Adolescent development of forebrain stimulant responsiveness: Insights from animal studies. *Annals of the New York Academy of Sciences*, 1021, 148–159.

Luna, B., & Sweeney, J. A. (2004). The emergence of collaborative brain function. fMRI studies of the development of response inhibition. *Annals of the New York Academy of Sciences*, 1021, 296–309.

Masten, S. V., & Hagge, R. A. (2004). Evaluations of California’s graduated licensing program. *Journal of Safety Research*, 35, 523–535.

McCartt, A. T., Hellinga, L. A., & Bratiman, K. A. (2006). Cell phones and driving: Review of research. *Traffic Injury Prevention*, 7(2), 89–106.

Posner, M. I., & Petersen, S. E. (1990). The attention system of the human brain. *Annual Review of Neuroscience*, 13, 25–42.

Preusser, D. F., Ferguson, S. A., & Williams, A. F. (1998). The effect of teenage passengers on the fatal crash risk of teenage drivers. *Accident Analysis and Prevention*, 30(2), 217–222.

Research Triangle Institute. (2001). *SUDAAN User’s Manual, Release 8.0*. Research Triangle Park, NC: Author.

Rosso, I. M., Young, A. D., Femia, L. A., & Yurgelun-Todd, D. A. (2004). Cognitive and emotional components of frontal lobe functioning in childhood and adolescence. *Annals of the New York Academy of Sciences*, 1021, 355–362.

SAS Institute, Inc. (2004). *SAS 9.1.3 Help and Documentation*. Cary, NC: Author.

Senserrick, T. M., Kallan, M. J., & Winston, F. K. (2007). Child passenger injury risk in sibling versus non-sibling teen driver crashes: A US study. *Injury Prevention*, 13(3), 207–210.

Simons-Morton, B. G., Lerner, N., & Singer, J. (2005). The observed effects of teenage passengers on the risky driving behavior of teenage drivers. *Accident Analysis and Prevention*, 37(6), 973–982.

Steinberg, L. (2004). Risk taking in adolescence. What changes, and why? *Annals of New York Academy of Sciences*, 1021, 51–58.

- Stutts, J., Feaganes, J., Rodgman, E., Hamlett, C., Meadows, T., Reinfurt, D., et al. (2003). *Distractions in everyday driving*. Washington, DC: AAA Foundation for Traffic Safety.
- Williams, A. F. (2001). *Teenage passengers in motor vehicles: A summary of current research*. Arlington, VA: Insurance Institute for Highway Safety.
- Williams, A. F. (2007). Contribution of the components of graduated licensing to crash reductions. *Journal of Safety Research*, 38(2), 177–184.
- Williams, A. F., & Ferguson, S. A. (2002). Rationale for graduated licensing and the risks it should address. *Injury Prevention*, 8, ii9–ii16.
- Williams, A. F., Ferguson, S. A., & McCartt, A. T. (2007). Passenger effects on teenage driving and opportunities for reducing the risks of travel. *Journal of Safety Research*, 38, 381–390.
- Young, K. L., Regan, M. A., & Hammer, M. (2003). *Driver distraction: A review of the literature*. Monash, Australia: Monash University Accident Research Centre.
- Zwicker, T. J., Williams, A. F., Chaudhary, N. K., & Farmer, C. M. (2006). *Evaluations of California's graduated licensing system*. Arlington, VA: Insurance Institute for Highway Safety.
- Katherine Heck** received her master's degree in public health from the University of Washington. She is a research specialist at the University of California, Davis, 4-H Center for Youth Development. Her research has focused on child and adolescent health, large data set analysis and survey research.
- Ramona Carlos** received her master's degree in child development from the University of California, Davis. She is an academic coordinator at the University of California, Davis, 4-H Center for Youth Development. Her research interests include social and emotional development and adolescent development.