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Peer Influence Predicts Speeding Prevalence Among Teenage Drivers

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Abstract

Objective—This research examined the psychosocial and personality predictors of observed speeding among young drivers. **Method.** Survey and driving data were collected from 42 newly-licensed teenage drivers during the first 18 months of licensure. Speeding (i.e., driving 10 mph over the speed limit; about 16 km/h) was assessed by comparing speed data collected with recording systems installed in participants' vehicles with posted speed limits. Questionnaire data collected at baseline were used to predict speeding rates using random effects regression analyses. For mediation analysis, data collected at baseline and at 6, 12, and 18 months after licensure were used. **Results.** Speeding was correlated with elevated g-force event rates, including hard braking and turning ($r = 0.335$, $p < 0.05$), but not with crashes and near crashes ($r = 0.227$; ns). Speeding prevalence increased over time. In univariate analyses speeding was predicted by day vs. night trips, higher sensation seeking, substance use, tolerance of deviance, susceptibility to peer pressure, and number of risky friends. In multivariate analyses the number of risky friends was the only significant predictor of speeding. Perceived risk was a significant mediator of the association between speeding and risky friends. **Conclusion.** The findings support the contention that social norms may influence teenage speeding behavior and this relationship may operate through perceived risk.

Keywords

adolescence; risk taking; motor vehicle crashes; naturalistic; learning to drive; kinematic; social influence

1. 0 Introduction

The high crash rate among novice young drivers (Williams, 2003; National Highway Traffic Safety Administration [NHTSA]; Twisk & Stacey, 2007) is thought to be due in part to inexperience and risky driving behavior (Williams, 2003; Clarke, Ward, Bartle, & Truman,

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2006). Of the various dimensions of risky driving, speeding is among the most prevalent (Elvik, 2006; McKnight & McKnight, 2003; Bingham, Shope, Parrow, & Raghunathan, 2007; Ouimet et al., 2008; AAA Foundation for Traffic Safety, 2011; Glendon, 2007). This is especially true among younger compared with older drivers (Begg & Langley, 2001; Williams, 2003; Fleiter, Watson, Lennon, & Lewis, 2006; NHTSA) and among males compared with females at all ages (Clarke et al., 2006; NHTSA; Scott-Parker, Hyde, Watson, & King, 2012). Speeding has been identified as an important contributing factor to fatal crashes (about 31% for drivers of all ages; NHTSA), particularly among young drivers (Clarke et al., 2006; NHTSA) and male drivers of all ages (NHTSA). Speeding (Gerrard, Gibbons, Benthin, & Hessling, 1996; Harre, Brandt, & Dawe, 2000; Klauer et al., 2011) and other risky driving behaviors (Simons-Morton et al., 2011a) appear to remain high, and possibly increase, during the early years of driving, presumably as adolescents gain driving confidence (Katila, Keskinen, Hatakka, & Laapotti, 2004).

1.1 Psychosocial Factors Associated with Speeding and Risky Driving

In addition to male sex, a range of variables are associated with speeding in adolescent populations, including greater vehicle access early in licensure (Klauer et al., 2011; Scott-Parker et al., 2012). Of particular interest to the current research is link to self-reported speeding of young driver psychosocial and personality factors, including risk propensity, cognitions regarding risk, and social influences.

1.2.1 Risk Propensity—It seems logical to assume that those with a general propensity for risk would be likely to speed. Not surprisingly, many studies have reported significant associations between risky driving behavior and sensation seeking (Jonah, 1997; Prato, Toledo, Lotan, & Taubman Ben-Ari, 2010) and similar personality traits (Lajunen, Parker, & Summala, 2004; Ulleberg & Rundmo, 2003; Lucidi et al., 2010). Additional support for the risk-taking propensity hypothesis is provided by studies showing that past speeding behavior predicts intentions to speed and engagement in other risky driving among adolescents (Forward, 2009; Scott-Parker et al., 2012) and adults (Elliott & Thomson, 2010). Moreover, speeding has been shown to co-occur with other risky driving behavior and non-driving risk behavior such as substance use (Jelalian, Alday, Spirito, Rasile, & Nobile, 2000; Ouimet et al., 2008; Shope & Bingham, 2008).

1.2.2 Cognitions Regarding Risk—Perceptions and attitudes about driving risk appear to be associated with speeding and other risky driving behavior among young drivers (Lawton, Parker, Stradling, & Manstead, 1997; Hartos, Eitel, & Simons-Morton, 2002; Hatfield & Fernandes, 2009; Machin & Sankey, 2008; Harre et al., 2000), although some studies reported no association (Elliott & Thomson, 2010; Beullens, Roe, & Van den Bulck, 2010). Those who perceived little risk in speeding (Lawton et al., 1997) appear to have lower intentions in doing so, particularly younger drivers (Lawton et al., 1997; Fernandes, Hatfield, & Soames Job, 2010). Other research based on the theory of reasoned action/theory of planned behavior has shown that attitudes toward speeding risk and perceptions about the prevalence, acceptability, expected outcomes, and personal control were associated with the intent to speed among young drivers (Forward, 2009; Conner, Smith, & McMillan, 2003) and adults (Elliott, Armitage, & Baughan, 2005; Elliott & Thomson, 2010; Conner et al.). In a prospective study with young Australian drivers, Scott-Parker et al. (2011) reported significant associations between self-reported speeding after licensure and reward sensitivity, depression, personal attitudes (e.g., it is sometimes okay to bend the rules), and previous speeding (as a learner).

Risk perception and other attitudes toward traffic safety were found to mediate the relationship between risky driving (including speeding) and the personality traits of

aggression, altruism, and normlessness (Ulleberg & Rundmo, 2003). Hatfield and Fernandes (2009) reported that the relationship between perceived risk and risky driving behavior was moderated by risk propensity (Hatfield & Fernandes). In addition to perceptions about driving risk, attitudes toward deviance been shown to be associated with a range of adolescent problem behaviors (Dielman, Campanelli, Shope, & Butchart, 1987; Brown, Bakken, Ameringer, & Mahon, 2008; Ngee Sim & Fen Koh, 2003) including risky driving behavior (Shope, Raghunathan, & Patil, 2003).

1.2.3 Social influence—Peer influence has been linked to speeding and other measures of risky driving. Scott-Parker and colleagues found that social norms and affiliation with risk-taking peers were associated with risky driving (Scott-Parker, Watson, & King, 2009). Simons-Morton et al. (2011b) reported that the number of friends who engaged in risky driving and other risk behaviors predicted risky driving (elevated g-force rates) in a sample of newly-licensed teenagers. Fernandes et al. (2010) found that peer influence was associated with DWI, but not speeding. Adolescents may be particularly susceptible to peer influence (Steinberg, 2004) and many studies have documented the powerful influence of the perceived and actual behavior of friends on adolescent risk behaviors (see review by Simons-Morton & Farhat, 2010). Friendship effects can include overt peer pressure and more subtle influence on social norms that support and encourage (or discourage) risk behavior (Allen & Brown, 2008). Friendship effects on risky driving may be due to social identity (Scott-Parker et al., 2009), modeling, peer pressure, or perceived social norms (Sarkar & Andreas, 2004), where adolescents behave in ways they perceive to be acceptable and expected by their close friends and peer group (Simons-Morton & Farhat, 2010). Of course, some adolescents are more susceptible to peer influence than others (Shope et al., 2003).

1.3 Study Purpose

This is one of the first studies to employ an objective, longitudinal measure of speeding, rather than police reports or driver self-reports of speeding, speeding intentions, or risky driving behavior (Hartos et al., 2002; Hatfield & Fernandes, 2009; Scott-Parker et al., 2009; Farmer, 2003). The data for the current analyses are from the Naturalistic Teenage Driving Study (NTDS), which employed instrumented vehicles to enable the continuous, objective assessment of driver speed. Previous analyses of the NTDS data indicated that speeding increased over the first 18 months of licensure and was greater among novice teenage drivers with primary access to a vehicle compared with teenage drivers who shared vehicles with parents (Klauer et al., 2011). In other analyses of these data teenagers had 4–5 times higher rates of crashes/near crashes (CNC) and 3–4 times higher rates of elevated g-force events than adults (Simons-Morton et al., 2011a).

Few previous studies have examined the relative contributions of multiple psychosocial and personality factors in explaining the variability in speeding when measured objectively. The purpose of the present research is to examine the psychosocial and personality predictors of observed speeding among young drivers. The study posits that the predictors of observed speeding behavior during the first 18 months of licensure will include driver propensity for risk; sensation seeking temperament; cognitions regarding risk, primarily perceived risk and tolerance of deviance; and peer influence, primarily susceptibility to peer pressure and friends risky behavior. The hypotheses include the following: (1) speeding prevalence will be greater among young drivers who report: (a) greater sensation seeking; (b) greater prevalence of substance use; (c) lower perceived risk; (d) greater tolerance of deviance; (e) greater susceptibility to peer pressure; and (f) more risk-taking friends; and (2) relationships between independent variables and speeding will be mediated by perceived risk.

2.0 Method

2.1 Participants and Data Collection

Participants included newly-licensed teenagers recruited through driving schools and local media in a Virginia metropolitan area. In Virginia at the age of 16 years and three months teenagers can obtain a provisional driver's license that allows them to drive without supervision, but with some restrictions on passenger and night driving. Identical twins were excluded because it would have been difficult for coders to distinguish the driver. Teenagers whose parents reported that they had been diagnosed with Attention Deficit Disorder or Attention Deficit Hyperactivity Disorder were excluded from the study because of their higher crash involvement (Barkley, 2004). Parent consent and teen assent were obtained according to the protocol that was reviewed and approved by the Virginia Tech University Institutional Human Subjects Review Board. Vehicle and survey data were collected from June 2006 to September, 2008.

2.2 Vehicle Data

Vehicle data were obtained by a data acquisition system installed in the participants' own vehicles within 3 weeks of licensure. The system included a computer that received and stored data from accelerometers that assessed kinematic data; forward radar that provided following distance; a global positioning system (GPS) that calculated mileage, vehicle position, and speed; and video recorders for continuous video images (Dingus et al., 2006). Cameras were located to enable continuous monitoring of the driver's face, the dashboard, and areas reachable by the driver's hands, and the forward and rearward roadway. Data were downloaded periodically by swapping the hard drives in the computers installed in the trunks of the vehicles. The following data were collected.

2.2.1 Driver and Passenger Identity—Video data for each vehicle trip (defined as ignition on to ignition off) were viewed by coders and the identity of the driver and the sex and relative age of each passenger were recorded. Teen driver sex and presence of teenage passenger were included in analyses.

2.2.2 Vehicle Ownership—Teens with a parent driving the instrumented vehicle more than 500 miles ($n = 22$) were considered to have shared vehicle access (Klauer et al. 2011); the other 20 teenage participants were considered to have primary vehicle access.

2.2.3 Night Driving—Night driving was coded by video observation of the ambient natural lighting at the start of the trip.

2.2.4 Speeding—Given the importance of vehicle speed and miles traveled, redundant sensors were installed in the data acquisition system to ensure these variables were collected. Thus, actual speed was assessed using the on-board vehicle network (OBD2 port), GPS data, or calibrated transmission pulse sensor. Speed limits were identified for pre-specified road segments commonly driven by most of the study participants. The road segments ranged from 200–1800 meters and the posted speed limits ranged from 25 mph (about 40 km/h), which is a common speed limit for residential areas, to 55 mph (about 90 km/h), which is a common speed limit on undivided highways. A speeding event was defined as going at least 10 mph (about 16 km/h) over the speed limit for at least 0.1 seconds. (There were too few events of more excessive speeding for useful analyses.) Two speeding variables were created: the first was the average number of speeding events (i.e., 10+ miles over the speed limit) per 10 or 100 miles; the second was the percent of time the participant drove at least 10 mph over the speed limit on the road segments.

2.2.5 Crashes and Near Crashes—Because crashes are relatively rare and the sample sizes in naturalistic studies tend to be small mostly due to high costs, combining crashes and near crashes into a single dependent variable increases analytic possibilities (Dingus et al., 2006). Near crashes are defined as an event that requires a rapid, evasive maneuver by the subject vehicle or any road user to avoid a crash (Lee, Simons-Morton, Klauer, Ouimet, & Dingus, 2011, p. 1474). Near crashes have been found to be valid and useful surrogates for crashes (Guo, Klauer, Hankey, & Dingus, 2010). In short, near crashes were “close calls” that were similar to crash events but did not result in actual contact. Crashes and near crashes (CNC) were identified by coders viewing video footage of highly elevated g-force events (e.g., $-0.65g$ longitudinal deceleration) recorded by accelerometers and short time to collision data from forward radar. Analyses were performed on CNC rates per 10 000 miles.

2.2.6 Elevated G-force Event Rates—A composite measure was formed that included the following elevated g-force events: longitudinal deceleration/hard braking ($-0.45g$); longitudinal acceleration/rapid starts ($0.35g$); hard left ($-0.50g$) and hard right turns ($0.50g$); and yaw (± 6 degrees within 3 seconds). Yaw is the *delta v* between an initial turn and the correction. A composite variable was created by counting any event over the threshold set for each of the five individual measures. The Cronbach’s alpha for the composite measure was 0.78 (Simons-Morton et al., 2011b). Analyses were conducted on the rates of elevated g-force events per 100 miles.

2.3 Questionnaire Data

Surveys administered at baseline and 6, 12, and 18 months after licensure assessed risk perception, substance use, and number of risky friends. Sensation seeking, tolerance of deviance, susceptibility to peer pressure were assessed only at baseline. The properties of the measures are reported in Table 1.

2.3.1 Sensation Seeking—The 40-item Sensation Seeking Scale Form V (Zuckerman, 1994) was administered to assess this personality trait. The scale includes items offering two possible choices such as “I sometimes like to do things that are a little frightening” (higher sensation seeking) vs. “A sensible person avoids activities that are dangerous” (lower sensation seeking). The total score was then dichotomized using the median split.

2.3.2 Substance Use—Substance use was measured using five items adapted from previous studies (Simons-Morton, Chen, Abroms, & Haynie, 2004). The items were: “On how many occasions (if any) have you done the following things in the last 30 days: smoked cigarettes, drank alcohol, been drunk, had five or more drinks/occasion, used marijuana?” Responses ranged from never to 40+ times.

2.3.3 Risk Perception—This measure, used in previous studies on driving behavior (Hartos et al., 2002; Simons-Morton, Hartos, Leaf, & Preusser, 2006), included 14 items that asked “How much risk for crash or injury do you think newly-licensed teens have if they drive unsupervised in the following situations?” The situations include driving late at night, while not wearing a seat belt, in unfamiliar areas, with teenage passengers, under the influence of alcohol, and with passengers who had been drinking. Response options were low to high risk on a 1–5 scale.

2.3.4 Tolerance of Deviance—This scale included 8 items that asked “how wrong do you think it is to...” do the following things? The five non-driving subscale items included the following: “...smoke cigarettes; drink alcohol; skip school; go to a movie instead of study for a test; and tear a page out of a library book”; the driving subscale included three

items: "...not wear a safety belt; exceed the speed limit; drive after having 2 or more drinks." Response options were very wrong, wrong, a little wrong, and not wrong. The scale was adapted from Shope and colleagues (2003); the items about driving were added to the scale by the research team.

2.3.5 Susceptibility to Peer Pressure—This 11-item scale included seven non-driving questions and four driving questions. The non-driving questions asked "What would you do if ...a friend offered you a drink at a party would you take it? ... a friend offered you a drink at a party would you want to take it? ... you are at a party where your friends are drinking, would you feel left out if you aren't? ... a friend dares you to smoke a cigarette and your parents don't want you to smoke, would you smoke? ... your friend dared you to tear a page out of a library book, would you? ... your friends are going to a movie and you should study for a test, would you go to the movie? ... your best friend is skipping school, would you?" The four driving items included the following: "If a friend encouraged you to speed would you? "If you got in a car driven by a friend who is not wearing a safety belt, would you buckle your safety belt?" "If you pick up a friend who does not put on a safety belt, would you insist that s/he buckles up?" "If a friend had been drinking and wants to drive you home after a party, would you go with him/her?" Response options were no, probably not, probably, and yes. The non-driving items are from Dielman et al. (1987); the driving items were added by the research team.

2.3.6 Risk-Taking Friends—Subjective norms were measured by asking about the risky behavior of the drivers' friends (risky friends). Adapted from the author's previous research, the measure included subscales assessing peer substance use (Simons-Morton et al., 2004) and risky driving behavior added by the research team for this study. The four non-driving items included the following: "How many of your friends would you estimate ... smoke cigarettes, drink alcohol, get drunk at least once a week, use marijuana." The three driving items included the following: "How many of your friends would you estimate ... do not use safety belts; exceed speed limits; drive after having two or more drinks in the previous hour." Response options were none, a few, some, most, all.

2.4 Statistical Analyses

The following measures of speeding were analyzed: the average events of 10+ mph over the limit per 10 miles; and percentage of 10+ miles over the limit. For longitudinal analyses, the speeding outcomes were examined with random effects regression with quarter as time variable. To assess the relationship between speeding and variables from the survey, Pearson's correlations were calculated. Questionnaire data collected at baseline, plus driver sex, time of day, teen passenger presence, and vehicle access, were used to predict speeding over time with random intercept regression (Rabe-Hesketh, Skrondal, & Pickles, 2005). Because the multiple measures of speeding within the same participant were correlated with each other, person identification was used as a cluster variable in this random regression analysis. The multivariate analysis evaluated the effects of the psychosocial and personality predictors significant in the univariate analyses on speeding 10+ mph over the limit per 10 miles. The random intercept regression was based on trip data because the day/night information was on each trip. Gender was treated as a time-invariant covariate in the analysis.

Analyses were conducted to assess whether risk perception mediated the relationships between psychosocial and personality predictors and speeding. Risk perception was assessed at each of the four time points because it was expected to change over time consistent with driving experience. This analyses followed procedures recommended by MacKinnon (2008) for testing mediators with longitudinal data. Specifically, data were arranged into two levels,

with repeated measures within participant as level one, and variables for individuals as level two. Three random intercept regressions were performed: (a) the prediction of speeding by risky friends (the independent variable); (b) the prediction of perceived risk (i.e., the mediator) by the independent variable; (c) and then the prediction of speeding by both risky friends and perceived risk.

3.0 Results

3.1 Participants

Participants included 42 teenagers (22 females and 20 males) from nine different high schools (and three home-schooled) with an average age of 16.4 years (± 0.3). Vehicles that were instrumented included 30 sedans, five minivans, and seven SUVs, 76% of which were less than 10 years old. Average teen mileage per month was 367 miles (590 km), which ranged from 315 miles (507 km) in the first month to 441 miles (710 km) in the last month (Lee et al., 2011).

3.2 Speeding Frequency and Change in Speeding Over-Time

Teens drove on the selected road segments a little more than 16% of all trips with average speeds of ± 6 mph above the speed limit. The values for the two speeding measures are shown by quarter in Figure 1. The average frequency of speeding 10+ mph over the speed limit ranged at each quarter from 4 to 7 times per 10 miles driven on the selected road segments, representing an average of 3.5% to 7% of the time. A noticeable increase can be observed in both measures of speeding over time, with increases of 50–100% from the first to last quarter. Assuming a linear trend during 18 months, Growth Curve Analysis showed that the slope for 10+ mph over the limit is 0.43, $p = 0.05$ and the slope for % time 10+ mph over limit is 0.53, $p = 0.029$, indicating a significant increase in speeding events over time.

3.3 Correlations Between Speeding, G-Force Event Rates, and CNC Rates

In previous analyses of data from this study we reported that there were 37 crashes and 242 near crashes among teenage participants for the entire 18-month study period (Lee et al., 2011). Elevated g-force event and CNC rates were significantly correlated ($r = 0.60$, $p < 0.001$; Simons-Morton et al., 2011a). In the current analyses, the correlation between speeding and CNC was $r = 0.227$ (ns) for 10+ mph over the limit per 10 miles and $r = 0.139$ (ns) for % 10+ mph over the limit. The Pearson correlation between speeding and elevated g-force event rates was 0.355 ($p < 0.05$) for 10+ mph over the limit per 10 miles and .247 (ns) for % time 10+ mph over the limit.

3.4 Psychosocial and Personality Predictors of Speeding

Table 1 shows the measurement properties and mean values of the psychosocial and personality variables. Alpha coefficients of internal consistency for the full scales were 0.69. The correlations among speeding and psychosocial variables, provided in Table 2, showed that the following variables measured at baseline were significantly associated with speeding prevalence during the first 18 months of licensure: sensation seeking, substance use, tolerance of deviance, susceptibility to peer pressure, and risky friends.

The univariate analyses predicting speeding by the baseline psychosocial variables, plus driver sex, time of day, teen passenger presence, and vehicle access are presented in Table 3. Results show that speeding was less common at night, but more common among those who reported higher sensation seeking, substance use, tolerance of deviance, susceptibility to peer pressure, and risky friends. The total scores and the driving and non-driving subscales were significant for tolerance of deviance and risky friends, but only the total score and the

non-driving subscale of the susceptibility to peer pressure scale were significantly associated with the two measures of speeding.

The multivariate analysis of speeding (+10 mph/100 miles) included only the significant predictors (total scales only) from the univariate analysis as covariates, controlling for driver sex, time of day, teen passenger presence, and vehicle access. Shown in Table 4, only risky friends was significantly associated with speeding; a trend was found for tolerance of deviance ($p = .07$) and susceptibility to peer pressure ($p = .06$).

Next, we examined the possible mediation of the relationship between psychosocial variables and speeding by risk perception, a variable that could be expected to vary over time with driving experience and was measured four times during the study. As shown in Figure 2, perceived risk was a significant partial mediator for the relationship between speeding and risky friends. Teens with more risky friends perceived significantly lower risk for risky driving ($p < 0.001$), and in turn, low perceived risk was significantly related to more speeding events ($p < 0.001$). Figure 2 also shows that the effect of risky friends on speeding was both direct and indirect through perceived risk.

4.0 Discussion

Speeding is a contributing factor in a high proportion of young driver crashes. The Naturalistic Teenage Driving Study enabled objective assessment of speeding and provided an opportunity to identify the predictors of speeding among young drivers. On average speeding increased over time, possibly as teenage participants gained confidence (Katila et al., 2004). The primary findings of the study were that having risky friends was significant predictor of speeding among novice teenage drivers and the relationship between risky friends and observed speeding was mediated by risk perception.

In univariate analyses we found that speeding was less prevalent at night, similar to what was found for g-force events with this sample (Simons-Morton et al., 2011b). Consistent with the study hypotheses and many previous studies (e.g., Shope et al., 2003; Sarkar & Andreas, 2004; Zuckerman, 2007; Bingham et al., 2007; Fernandes et al., 2010; Scott-Parker et al., 2012), baseline predictors of speeding included sensation seeking, substance use, tolerance of deviance, susceptibility to peer pressure, and risk taking friends.

However, we did not find that males engaged in speeding more than females, which has commonly been reported in other studies, but is consistent with previous analyses of the NTDS data that found no effect of sex on crash/near crash rates or elevated g-force event rates (Simons-Morton et al., 2011a; 2011b). The small voluntary sample may be a partial explanation for this finding in that a few of the highest risk participants were girls.

The lack of significant multivariate effects for sensation seeking, substance use, and risk perception is contrary to cross-sectional findings on the topic. Tolerance of deviance and susceptibility to peer pressure, which have been found in previous research to predict risky driving (Shope & Bingham, 2008), approached significance. However, the only variable that was significantly associated with speeding in multivariate analyses was risky friends. Peer influence is possibly the most consistent risk factor for teenage risk behavior (Simons-Morton & Farhat, 2010; Brown et al., 2008), including risky driving (Fernandes et al., 2010; Hatfield & Fernandes, 2009). Previous analyses of these data found that the risky friends variable was associated with rates of crashes/near crashes and elevated g-force events (Simons-Morton et al., 2011b). Risky friends could increase the prevalence of speeding through several possible mechanisms. One possible mechanism is selection, where adolescents prone to risky behaviors such as speeding would select friends with similar attitudes and behaviors. Alternatively, risky friends might provide socializing effects on

their friends, either indirectly through normative influence favoring risky driving behavior or directly by overt pressure encouraging risky behavior. Additional research is needed to determine the nature of peer influence on teenage risky driving.

Curiously, perceived driving risk assessed at baseline did not predict speeding. However, perceived risk measured over time partially mediated the relationship between speeding and risky friends. This finding suggests that one important mechanism by which risky friends may influence speeding behavior is through friends' effect on perceptions about speeding risk. Presumably, having risky friends reduced young drivers' perceptions about the risk of speeding, and lower risk perceptions are associated with greater likelihood of speeding. Previous research identified risk perception as a mediator of the relationship between personality and risky driving (Ulleberg & Rundmo, 2003).

4.1 Study Strengths and Limitations

The primary strengths of the study include the objective measurement of speeding over an 18-month period of assessment. However, the small size and regional nature of the sample limits generalization of the findings. Also, the road segments studied constitute only about 16% of the participants driving and speeding may have been more or less prevalent than on other road segments not studied.

4.2 Conclusion

In this study of novice young drivers' risky friends was the best predictor of speeding, suggesting an effect of social influence. Moreover, the relationship between speeding and risky friends was cognitively mediated by risk perception. The data suggest the potential for interventions that would address perceived risk and perceived norms regarding speeding.

4.3 Impact on Industry

Speeding is a major cause of motor vehicle crashes. Our findings suggest that speed management among young drivers remains an important concern for the transportation industry.

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Highlights

- Naturalistic and survey data were collected from instrumented vehicles driven by 42 newly licensed teenage drivers.
- Speeding 10 mph over the speed limit was assessed
- Speeding was correlated with elevated g-force event rates, including hard braking and turning ($r = 0.335$, $p < 0.05$), but not with crashes and near crashes ($r = 0.227$; ns).
- Speeding prevalence increased over time
- In univariate analyses speeding was predicted by night vs. day trips, higher sensation seeking, substance use, deviance acceptance, susceptibility to peer pressure, and number of risky friends.
- In multivariate analyses, controlling for time of day and driver sex, the number of risky friends was the only significant predictor of speeding.
- In longitudinal analysis, perceived risk was a significant mediator of the associations between speeding and risky friends.
- Social norms appear to influence teenage speeding behavior and this relationship may operate through perceived risk.

Figure 1. Teen drivers' speeding behavior indicated by average events of 10+ miles over speed limit per 100 miles driven and percentage of 10+ miles over the limit in first 18 months after licensure

Figure 2.

Perceived risk of risky driving as a mediator between risky friends and speeding

Note. The values are unstandardized estimates. $^{***}p < 0.001$.

Table 1

Psychosocial and personality variables for teenage participants: number of items, range, means, standard deviations, and Cronbach's alpha coefficients for each scale.

Psychosocial and Personality Variables	# of Items	Range	Mean (SD)	Cronbach's Alpha
Sensation Seeking Scale (Form V)	40	1–2	1.38 (0.17)	0.87
Substance Use Behavior	5	0–7	0.24 (0.49)	0.69
Risk Perception	14	1–5	3.82 (0.47)	0.85
Tolerance of deviance	8	0–3	0.89 (0.53)	0.86
Non-driving subscale	5	0–3	0.87 (0.75)	0.73
Driving Subscale	3	0–3	0.64 (0.56)	0.78
Susceptibility to peer pressure	11	0–3	0.53 (0.40)	0.77
Non-driving subscale	7	0–3	0.66 (0.48)	0.70
Driving subscale	4	0–3	0.31 (0.39)	0.63
Risky Friends	7	0–4	0.81 (0.54)	0.80
Non-driving subscale	4	0–4	0.71 (0.63)	0.80
Driving subscale	3	0–4	0.93 (0.58)	0.60

Table 2

Correlation matrix for speeding and psychosocial and personality variables (n = 42)

Variable	1	2	3	4	5	6	7
1 10+ mph over limit per 10 miles							
2 % 10+ mph over limit	.93***						
3 Sensation Seeking	.44**						
4 Substance Use	.53***	.52***					
5 Risk Perception	.03	.63***	.65***				
6 Tolerance of Deviance	.35*	-.01	-.36*	-.29			
7 Susceptibility to peer pressure	.49**	.31*	.47**	.32*	-.27		
8 Risky Friends	.59***	.47**	.49**	-.07	.65***	.47**	.66***
		.50***	.56***	.53***			

Note. Speeding variables are average across 18 months. Psychosocial and personality variables are baseline measures.

* p < 0.05;

** p < 0.01;

*** p < 0.001.

Table 3

Univariate analysis predicting speeding with teen's baseline self-reported psychosocial and personality variables (n = 42)

Variable	10+ mph over limit per 10 miles	% 10+ mph over limit
	Beta	Beta
Teen driver sex	0.02	3.86
Night vs. Day	-2.00 ***	-2.52 ***
Primary vs. Shared Vehicle Access	2.61	3.09
Teen passenger vs. no passenger	-2.12	-2.01
Sensation Seeking	13.86 ***	17.07 ***
Substance Use	4.50 **	6.26 **
Risk Perceptions	-1.26	-0.65
Tolerance of Deviance		
Total (8 items)	5.38 ***	6.07 *
Non-driving subscale (5 items)	3.00 ***	3.50 **
Driving subscale (3 items)	4.28 ***	4.34 **
Susceptibility to Peer Pressure		
Total (11 items)	6.03 **	7.44 ***
Non-driving subscale (7 items)	5.56 **	7.13 ***
Driving subscale (4 items)	2.61	2.53
Risky Friends		
Total (7 items)	6.11 ***	6.77 ***
Non-driving subscale (4 items)	4.97 ***	5.43 ***
Driving subscale (3 items)	4.55 ***	5.17 ***

Note. Beta: unstandardized estimates.

*
 $p < 0.05$;

**
 $p < 0.01$;

 $p < 0.001$.

Table 4

Multivariate analysis predicting teen drivers' speeding indicated by 10+ mph over limit per 100 miles (controlling for driver sex, time of day, teen passenger presence, and primary vs. shared vehicle) (n = 42)

Variable	Beta	p
Sensation Seeking	9.87	.17
Substance Use	−0.41	.87
Tolerance of Deviance ^a	4.14	.07
Susceptibility to Peer Pressure ^a	−6.87	.06
Risky Friends	5.78 ^{**}	.01

Note.

^a Analyses for tolerance of deviance and susceptibility to peer pressure are conducted with the full scales. Beta: unstandardized estimates.

* $p < 0.05$;

** $p < 0.01$;

*** $p < 0.001$.