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Susceptible to Social Influence: Risky "Driving" in Response to Peer Pressure[1]

JENNIFER L. SHEPHERD[2]
OMNI Institute
Denver, CO

DAVID J. LANE
Western Illinois University

RYAN L. TAPSCOTT AND DOUGLAS A. GENTILE
Iowa State University

In 2 studies, college students were socially influenced to be risky or not in a driving simulation. In both studies, confederate peers posing as passengers used verbal persuasion to affect driving behavior. In Study 1, participants encouraged to drive riskily had more accidents and drove faster than those encouraged to drive slowly or not encouraged at all. In Study 2, participants were influenced normatively or informationally to drive safely or riskily. As in Study 1, influence to drive riskily increased risk taking. Additionally, informational influence to drive safely resulted in the least risk taking. Together, the studies highlight the substantial influence of peers in a risk-related situation; in real life, peer influence to be risky could contribute to automobile accidents.

Young adults have long had a reputation for being careless, dangerous risk takers who appear to avoid considering the potential consequences of their reckless actions. Scientific evidence in a variety of behavior domains suggests that the first part of this reputation has been rightfully earned; young adults engage in risk behavior more often than older adults or children (Steinberg, 2004).

Psychologists have labored to explain why young people appear to be susceptible to risk taking. Risk-taking behaviors are associated with social, economic, psychological, and health costs that should logically be considered deterrents. In particular, risky driving is very costly: Automobile accidents are the number-one cause of death among U.S. teenagers (Dee & Evans,

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[2]Correspondence concerning this article should be addressed to Jennifer L. Shepherd, OMNI Institute, 899 Logan Street, Suite 600, Denver, CO 80203. E-mail: jleighshep@gmail.com

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2001), and the financial toll of accident-related consequences is a staggering $150 billion annually (Injuryboard, 2006). Young men in their late teens and early 20s are particularly susceptible to automobile accidents; their fatality risk is 4 times higher than that of the average driver (Borenstein, 2007).

Although inexperience accounts for some of the discrepancy in risky driving behavior among youth compared to adults, other factors are important as well. One of these factors, social influence from passengers, is particularly relevant in explaining risky driving (e.g., Steinberg, 2007). Understanding the circumstances under which young drivers fall prey to social influence from their passengers may help to reduce risky driving behavior and save lives by reducing the number of automobile accidents.

Social Influence

Influence from others can be direct and explicit, as in the case of peer pressure, where one or more people cajole, bully, or outright command others to change their behavior to conform to the group. Social influence can also be subtle; the mere presence of others or the perception of their preferences can create a motivation to change one's behavior to align with the group (Aronson, Wilson, & Akert, 1999).

Social psychology distinguishes between two main types of social influence: normative and informational, each dominated by a different motive, both of which serve to maintain a positive self-image (Cialdini & Goldstein, 2004). Normative social influence is driven by the desire to be accepted by and to receive the approval of others, whereas informational influence stems from the need to be correct (Aronson et al., 1999; Deutsch & Gerard, 1955). These two types of influence may work in tandem to affect behavior, or they may oppose each other. For example, in the case of risky driving, drivers' training courses and driving laws provide informational influence to drive safely, but risk-endorsing peers may encourage normative risky driving.

Consistent with this idea, research on the role of social influence in a driving situation indicates that peers play a significant role in determining risky driving behavior, despite learned safe-driving regulations (Williams, 2006). In general, the risk of a young person being involved in a car accident is significantly greater when peer passengers are present (Chen, Baker, Braver, & Guohua, 2000). Furthermore, driving-related norms provided by peers (e.g., approval of speeding) have been associated with self-reported speeding behavior (Fleiter, Watson, Lennon, & Lewis, 2006).

Most of the research on risky driving has yielded correlational or epidemiological data that do not allow for claims of causality; observational studies are relatively rare, and experimental studies are virtually absent.

However, the few observational and experimental studies present in the literature have been consistent with correlational data in suggesting that the presence of peers increases risky driving behavior (e.g., Simons-Morton, Lerner, & Singer, 2005). For example, Baxter et al. (1990) discreetly followed drivers on a public road and noted several indicators of risky driving (e.g., speeding, failure to use a turn signal, following too closely), as well as characteristics of passengers when present (e.g., age, gender). Differences in driver risk taking did depend on passenger presence and passenger characteristics; the presence of an older female passenger reduced risk taking, whereas a male passenger increased riskiness. Baxter et al. (1990) attributed this difference to social norms: Drivers are motivated to follow the driving norms likely to be endorsed by their passenger(s). Therefore, risk-approving young male passengers engender risk taking, whereas risk-disapproving older females foster risk avoidance. Similarly, Conner, Smith, and McMillan (2003) found that normative beliefs about risky driving were especially powerful when a male passenger was present, and participants in a study conducted by Parker and colleagues (Parker, Manstead, Stradling, Reason, & Baxter, 1992) believed that young males would be the least disapproving of recklessness.

One of the few experimental studies in the risky driving literature demonstrated a causal link between peers and risky driving tendencies by examining the influence of a group on driving-related behavior. In the study, Gardner and Steinberg (2005) randomly assigned adolescents, college students, and adults to work alone or with three peers. In addition to pencil-and-paper measures of risk behavior, participants played a driving-related computer game (*Chicken*) that allowed for risk taking. Among both of the younger groups, peer presence significantly increased risky driving, although peer influence was not experimentally manipulated. The researchers reasoned that the presence of peers is particularly influential for young drivers.

A second experimental study found that peer passengers can have a positive effect in improving safe driving practices by telling drivers when their driving is unsafe (Hutton, Sibley, Harper, & Hunt, 2002). In the study, feedback from female passengers was used to target specific risky driving behaviors: speeding, mirror checking, and following distance. While the passenger was present, drivers drove more safely in terms of the risk behavior targeted by their passenger, despite not knowing (initially) which behavior had been targeted.

Although these two studies provide some causal evidence, there is still a dearth of experimental research in the risk-taking literature to determine that social influence from peers alters driving behavior. Therefore, the current studies are unique and valuable. First, they provide empirical testing of the widely accepted supposition that peer influence increases risky driving behavior among young people, in addition to testing whether peers can reduce recklessness. Second, the current studies test whether young adults are more susceptible to comply with informational influence that advocates safety or risk-endorsing normative influence.

Study 1

The purpose of the first study was to induce social influence and to measure subsequent risky driving behavior. Only men were used as participants in Study 1 because previous research has suggested that males are particularly likely to be influenced by driving-related social norms (Conner et al., 2003; Fleiter et al., 2006) and because males are more likely to take risks when driving (Harre, Field, & Kirkwood, 1996). Because the influence provided by real peers would not allow for sufficient experimental control, peer confederates were used to create social influence in a simulated driving situation.

Method

Participants

Male undergraduates ($N = 199$) from two midwestern universities participated in the study in exchange for credit in a psychology course. The sample was predominantly Caucasian (88%) and freshmen (47%). Participants' mean age was 19.8 years ($SD = 1.9$).

Materials

Driving simulation was conducted with Enthusia Professional Racing (Konami, 2005) for Sony PlayStation®2, a game known for realistic automotive physics and "real-world" handling (Campbell, 2005; Magrath, n.d.). As one reviewer noted, "Enthusia is a driving game that places a premium on driving skill" (Ekberg, 2005). A Madcatz Universal MC2™ non force-feedback, vibrating driving wheel, accelerator pedal, and brake pedal were connected to the PlayStation®2 to simulate driving in an actual car as much as possible. Television screen sizes were 19 inches (48.3 cm) and 20 inches (50.8 cm), and participants sat approximately 2 feet (0.6 m) from the screen. Game play was recorded on videocassette with a videocassette recorder.

Procedure

Male undergraduates were recruited to participate in a driving simulation study. Each experimental session consisted of one actual participant and two undergraduate confederates of varying gender, approximately the same age as the participants, who pretended to be participants. In describing the study, the experimenter established the cover story that the purpose of the experiment was to study differences in performing a task alone, as compared to performing the task in front of an audience. Participants were told that playing a driving videogame would serve as the task.

During the study, participants played the driving game twice: once by themselves and once with the confederates present. In the alone-first condition, the participant played the driving game alone, then played a second round of the game in front of the confederates. The order was reversed in the group-first condition, and random assignment was used to determine which session occurred first.

The participant and confederates participated in a rigged drawing such that participants believed that they had been randomly selected to play the driving game during the group portion of the study. After the drawing, all three "participants" were shown how to use the controls of the game and were given the instructions for the session. Participants were told to visualize themselves driving their car; they were to drive one lap of the course without hitting anything, to observe regular traffic rules (i.e., stay in the righthand lane), and to assume a 40 mph (64.4 km/h) speed limit. During the alone session, participants imagined driving themselves to the airport; while in the group session, they imagined driving two passengers [the confederates] to the airport.

The course driven by participants was carefully chosen to resemble actual driving, rather than racing. The course, which was identical in all conditions, consisted of a mostly curving highway through a city scene, although there were a few points in the course where the road was straight. The view was set to resemble looking out a windshield. The car being driven was not visible at any point during the game. A speedometer was also visible during game play, and a small black flag would appear briefly in the corner of the screen every time the car collided with, bumped against, or hit something. Other cars were not present during the driving sessions in order to reduce the likelihood of a "racing" mindset in particpants, as well to restrict accidents to being only those resulting from participant behavior. On average, the duration of one session of driving was just under 3 min.

During the group driving session, the confederates engaged in one of three dialogues, as determined prior to the session by random assignment. In the *pro-risk condition*, the confederates encouraged the participant to drive faster and not worry about crashing into things. They would laugh if the participant did crash, and would make statements such as "Go faster!" and "It's boring if you go slow." In the *anti-risk condition*, the confederates encouraged the participant to drive slower and avoid accidents. Sample statements include “I’d go slower if I were you,” and “You’re driving too fast.” In the *neutral condition*, the confederates talked about topics not related to driving, such as the weather, classes, or going on a vacation. The amount of conversation initiated by the confederates was roughly equal across the three social influence conditions,[3] and the experimenter, who left the room after giving the instructions, was blind to the social influence condition. Therefore, the study design was a 2 (Alone First vs. Group First) × 3 (Influence Type: anti-risk, neutral, or pro-risk) × 3 (Confederate Gender: both male, both female, or mixed gender) mixed factorial.

After each driving session (alone and group), participants answered a brief questionnaire about their experience with the game to be consistent with the cover story that the study was about task performance, and to assess participants’ perceptions of their performance. During these questionnaires, the participant and confederates were separated into different rooms, and the participant believed that the confederates were answering a similar questionnaire. A final questionnaire assessed participants’ opinions about their actual driving behavior and their driving history. After completing both driving sessions and all of the questionnaires, all participants were assessed for suspicion about the study purpose and about the confederates before being fully debriefed.

Measures

Risky driving behavior. Objective measures of risky driving behavior were recorded by the driving game: number of accidents and maximum speed. A higher number of accidents with the curb, tunnel walls, or guardrails and higher maximum speed were considered risky driving. Average speed was calculated by watching the videotape recording for each driving session and keeping track of the current speed every 20 s until the end of the session. These interval speeds were then summed and divided by the total number of observations ($M = 8.7$ observations per participant) to yield the overall average.

Driving opinions and history. Participants reported on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) their level of agreement with how safe a driver they are in real life. They also reported the

[3]Post hoc analyses confirm that the amount of conversation (as rated independently by both confederates; interrater reliability $\alpha = .88$) was equal among participants in the anti-risk and pro-risk conditions of Study 1 ($p = .18$). In the neutral condition, the confederates talked primarily to each other, so participants were expected to talk less in this condition than in the other conditions.

number of times they had received a speeding ticket (open-ended) and how often they drove (1 = *rarely*; 2 = *a few times per month*; 3 = *at least once per week*; 4 = *daily*).

Results

During debriefing, 6 participants expressed suspicion of the confederates before the deception was revealed by the experimenter, so their data were excluded from analyses. All reported analyses were conducted on a total sample size of 193, except where otherwise noted. Participants did not have much experience playing driving videogames; 61% reported playing them less than once per month. Experience with videogames in general and with driving games in particular was equal across the social influence conditions (ps = .14 and .12, respectively). Overall, the participants tended to follow the experimenter's instructions about driving safely. The average number of accidents (minor and severe) was 5.27 ($SD = 5.04$) and 5.39 ($SD = 5.53$) in the alone and group sessions, respectively; almost all were very minor accidents. Likewise, the average speeds[4] were 38.9 mph (62.6 km/h; $SD = 5.94$) in the alone session and 40.0 mph (64.4 km/h; $SD = 7.01$) in the group session.

Social Influence Effects

To test the primary hypothesis that social influence would affect driving performance, we conducted 3 (Influence: pro-risk, neutral, anti-risk) × 2 (Alone First vs. Group First) × 2 (Session: alone vs. group) repeated-measures ANOVAs. Number of accidents, maximum driving speed, and average speed served as the dependent variables in these analyses; each variable was assessed at two time points—when participants drove alone and when the confederates were present.

There was a significant main effect of social influence on maximum driving speed, $F(2, 186) = 10.31$, $p < .001$. Subsequent t tests reveal that participants in the pro-risk condition drove faster than did those in the neutral condition, $t(129) = 4.69$, $p < .001$, $d = 0.83$; who, in turn, drove faster than did those in the anti-risk condition, $t(123) = 2.59$, $p < .02$, $d = 0.47$. Accordingly, those in the pro-risk condition drove faster on average than did those in the

[4]It was deemed important to have a measure of average speed because the accelerator pedal was very sensitive to pressure, and many participants inadvertently obtained a momentarily high maximum speed that did not accurately reflect their driving behavior for the majority of the driving session. Videotape malfunctions resulted in a loss of data for 29 participants in Study 1; thus, the analyses involving average speed were conducted on a sample size of 164.

Table 1

Mean Maximum Speed (Miles Per Hour) by Risk Condition, Order Condition, and Session: Study 1

	Pro-risk			Neutral			Anti-risk		
	N	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*
Alone first	34			30			27		
Alone		65.12	16.06		61.70	11.44		64.67	14.25
Confederates present		78.38	17.08		62.33	13.05		57.26	9.90
Group first	33			34			34		
Confederates present		77.79	13.46		69.62	13.33		62.35	14.24
Alone		75.67	15.72		67.29	14.19		60.82	16.16

anti-risk condition, $t(126) = 7.21$, $p < .001$, $d = 1.28$. These analyses indicate that the social influence manipulation was successful: Participants who were encouraged to drive faster were more likely to speed, and those who were encouraged to drive slower drove more slowly.

Interestingly, the significant social influence that occurred for participants who experienced the group session first persisted when they drove alone, although the confederates were no longer present. This finding was revealed by a significant Social Influence × Order × Time interaction, $F(2, 186) = 5.48$, $p < .01$. This interaction is evident in Table 1: The mean maximum speed when driving alone was the same, regardless of social influence condition, for participants who drove alone first because social influence had not yet occurred ($p = .59$). In contrast, differences by social influence condition in maximum speed were found when the confederates were present, whether or not participants had already driven alone, as well as for participants who drove alone after driving with the confederates present.

Follow-up *t* tests were conducted to confirm the persistance of the social influence effect. These analyses confirm that, among participants driving alone who had already driven with the confederates present, those in the pro-risk condition drove faster than did those in the anti-risk condition, $t(65) = 2.80$, $p < .01$, $d = 0.69$. The difference in driving speed between those in the pro-risk and neutral conditions was not significant ($p > .10$); the difference between the neutral and anti-risk conditions was marginally significant, $t(66) = 1.75$, $p = .08$, $d = 0.40$.

Table 2

Mean Number of Accidents by Risk Condition, Order, and Session: Study 1

	Pro-risk			Neutral			Anti-risk		
	N	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*
Alone first	34			30			27		
Alone		5.79	4.53		5.93	4.83		5.70	4.19
Confederates present		6.41	5.40		2.43	3.33		1.15	1.81
Group first	33			34			34		
Confederates present		11.46	6.24		6.76	4.23		3.35	3.66
Alone		6.49	5.94		5.00	5.55		2.82	4.33

The social influence manipulation was equally successful when number of accidents served as the indicator of risky driving, $F(2, 186) = 19.20$, $p < .001$ (see Table 2). More specifically, there was a significant main effect of social influence such that participants in the pro-risk condition caused more accidents when the confederates were present than did those in the neutral and anti-risk conditions, $t(129) = 4.42$, $p < .001$, $d = 0.78$; and $t(126) = 7.28$, $p < .001$, $d = 1.30$, respectively. Furthermore, those in the anti-risk condition had fewer accidents than did those in the neutral condition, $t(128) = 3.38$, $p = .001$, $d = 0.60$.

The main effect of influence was qualified by a significant interaction of order and time on number of accidents. Regardless of social influence condition, participants were involved in more accidents their first time driving the course than when they were driving the course for the second time, $F(1, 186) = 42.20$, $p < .001$, probably because of practice effects. The interaction of social influence and order did not reach the conventional level of significance ($p > .07$), nor did the interaction of social influence, order, and time ($p > .80$).

The repeated-measures ANOVA on average speed revealed a significant main effect of time. Participants drove faster, on average, in the group session, $F(1, 155) = 3.98$, $p < .05$. This main effect was qualified by a significant Order × Time interaction, $F(1, 155) = 31.29$, $p < .001$ (participants drove faster the second time they played); and a significant Time × Order × Social Influence interaction, $F(2, 155) = 6.13$, $p < .01$. As shown in Table 3, partici-

Table 3

Average Speed (Miles Per Hour) by Risk Condition, Order, and Session: Study 1

	Pro-risk			Neutral			Anti-risk		
	N	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*
Alone first	30			22			23		
Alone		38.30	5.62		36.51	4.74		37.75	5.28
Confederates present		46.61	8.56		40.19	6.73		38.89	4.09
Group first	26			29			31		
Confederates present		39.19	8.01		38.69	4.84		36.55	3.74
Alone		42.75	8.42		40.06	5.10		37.85	3.95

pants in the pro-risk condition who had already driven alone drove significantly faster than did participants in all other conditions (all *p*s $< .01$).

Specific Confederate Effects

Confederate gender was expected to be a moderator of social influence on driving behavior. Therefore, we conducted additional repeated-measures ANOVAs to predict number of accidents and driving speed from social influence, order, and confederate gender. Although the main effects of social influence remained significant, as previously reported, neither the main effect of gender nor the interactions between influence and gender, order and gender, or all three variables were significant predictors of any indicator of risky driving behavior (all *p*s $> .30$). These analyses suggest that in the current study, the confederate peers were equally influential in manipulating risky or safe driving, regardless of their gender.

To determine whether or not the mere presence of peers (in absence of any overt social influence) affected average driving speed, we conducted a Confederate Gender × Time × Order repeated-measures ANOVA for participants in the neutral condition only. The main effect of time was not significant, suggesting that the mere presence of confederates did not affect average driving speed ($p = .51$). However, the analysis revealed a significant

Order × Time interaction, such that participants' average speed was slower their first time driving, $F(1, 45) = 12.66$, $p = .01$. In addition, there was a significant three-way interaction between confederate gender, order, and time, $F(2, 45) = 5.66$, $p < .01$. Follow-up ANOVAs revealed that average speed did not differ by confederate gender when participants in the neutral condition were driving for the first time ($p = .43$). There was, however, a significant difference in average speed by confederate gender for participants in the neutral condition who had already driven alone, $F(2, 19) = 3.52$, $p = .05$. Although the results should be considered cautiously because of very small cell sizes (6 in the male–male condition), subsequent t tests revealed greater average speed for participants who drove with two male confederates ($M = 45.5$, $SD = 8.8$) versus those who drove with one male and one female confederate ($M = 37.2$, $SD = 5.7$), $t(14) = 2.29$, $p < .04$, $d = 1.22$. The difference in average speed was not significant for the other two confederate gender comparisons (ps > .16).

We conducted two additional Confederate Gender × Time × Order repeated-measures ANOVAs, with maximum speed and number of collisions as the dependent variables. In predicting maximum speed, none of the main effects or interactions were significant, indicating that neither confederate presence nor practice effects affected maximum driving speed for participants in the neutral condition (all ps > .30). For number of collisions, there was a significant Order × Time interaction, $F(1, 58) = 19.62$, $p < .001$. Participants in the neutral condition had fewer collisions their second time driving, especially if the confederates were present. Confederate gender did not affect number of collisions.

Non-Simulated Driving Analyses

To see whether driving behavior during the simulation was related to actual, previous driving behavior, number of accidents and maximum speed were standardized and then combined into an index of risk taking. A median split was conducted on the index, and this variable was used to predict whether or not participants thought they were safe drivers in real life. This analysis revealed that participants who drove above the median level of riskiness were significantly less likely to say they were safe drivers than those who drove below the median level of riskiness, $F(1, 191) = 9.99$, $p < .01$. There was also a trend that did not reach statistical significance that participants who drove above the median level of riskiness during the simulator had received more speeding tickets: 1.18 tickets versus 0.96 tickets for those below the median level of riskiness, controlling for frequency of driving.

Discussion

Participants were deliberately and strongly influenced by peers while performing a simulated driving task. Using only verbal persuasion, the peers were able to improve safe driving in the anti-risk condition and to increase risky driving in the pro-risk condition. Researchers have long thought that peers influence each other to take risks; the current study adds experimentally obtained support for this conclusion. Although it is worrisome that risky driving is easily induced via peer pressure, it is encouraging that the opposite is also true: Safety-minded peers can increase safe driving behavior.

The "success" of the pro-risk social influence has important implications for risk behavior. A young person may know how they ought to behave in a risky situation, but when actually faced with a risk-conducive situation, he or she may yield to peer influence to behave recklessly. This behavior may put the young person at risk for negative consequences, such as being involved in a car accident. This is in accordance with the finding that young people will acknowledge the riskiness of their behavior after the fact, but still behave recklessly in the moment (Reyna & Farley, 2006). Even people who habitually commit risky driving violations, such as driving under the influence (DUI), agree that it is not smart to drink and drive (Greenberg, Morral, & Jain, 2005). Research on the validity of driving simulators has suggested that there is a significant correlation between simulated driving behavior and actual driving behavior (Lee, Cameron, & Lee, 2003; Reimer, D'Ambrosio, Coughlin, Kafrissen, & Biederman, 2006). Therefore, conditions such as peer influence that encourage risk taking during a driving simulation task could translate to risk taking on the road.

The lack of overall significant moderation by confederate gender in Study 1 is initially surprising, given that other studies of passenger effects have found that male passengers are more likely to lead to risky driving than are female passengers (Baxter et al., 1990; Conner et al., 2003). However, because the majority of previous studies have been correlational or observational in design, it is perhaps the case that actual female passengers generally discourage risk taking, whereas male passengers generally encourage risk taking. Therefore, it may be that young drivers give in to both types of social influence from their peers in real life, but the nature of the peer influence is naturally confounded with passenger gender. In Study 1, influence was followed, regardless of peer gender: Risk-endorsing female peers were heeded, as were risk-avoidant male peers. The combinations of risk-endorsing females and risk-reluctant males may occur seldom in real life, which would lead to the gender differences reported in prior research.

Inadequate sample size limits firm conclusions, but it is interesting that the mere presence of two male confederates led to faster average driving speeds among participants in the neutral condition who had already driven the course alone. For all three gender combinations, the confederates in the neutral condition did not say anything related to driving, but when they were both male, the participants appeared to be influenced indirectly to drive more quickly, perhaps by their stereotype of or experience with young male drivers. In other words, participants may have expected male peers to approve of speeding; therefore, they drove faster than did participants with at least one female "passenger" (cf. Baxter et al., 1990).

Surprisingly, the influence to drive safely or recklessly in the current study persisted when participants were driving alone, which suggests that peers need not be present to affect behavior if social influence has already occurred. Perhaps engaging in the same behavior (i.e., driving) when alone as when their peers were present meant that they defaulted to what they had been doing—driving riskily in the pro-risk condition and driving safely in the anti-risk condition—rather than considering the consequences of their behavior. It could also be the case that peer influence during the group session led participants to believe that others admire risk-taking behavior. This belief may have carried over when the participants were driving alone, leading to the same pattern of results as when the peer confederates were present.

A potential criticism of this study is the lack of consequences for unsafe driving. Unlike real life, there were no negative consequences for participants if they failed to follow the 40 mph (64.4 km/h) speed limit imposed by the experimenter. Although this is a valid limitation, the lack of consequences for speeding found in this study may have real-world parallels. According to a survey by the National Highway Traffic Safety Administration (1998), two thirds of drivers admitted at least occasional speeding during the previous year, but only 14% were cited by law-enforcement officers. Even among those reporting the highest levels of unsafe driving, the majority reported not being stopped by the police in the past year. Moreover, participants in Study 1 did appear to be taking the speed limit seriously, based on the objective speed measure: Across all conditions, average speeds were 40 mph (64.4 km/h) or less. Nevertheless, the lack of consequences (e.g., for collisions) is a limitation that we addressed in Study 2.

Although it was clear from Study 1 that social influence was successfully manipulated to affect driving behavior, there were additional concerns that were not addressed. First, because only males participated, it is not clear whether or not the results would generalize to females. Second, all three social influence conditions in Study 1 utilized normative influence from peers, so it is unclear whether other types of influence (e.g., informational) would also play a role. We conducted a second study, using the same basic methodology, to address these issues.

Study 2

Study 2 was designed to replicate and extend the findings from Study 1. Participants were once again subjected to social influence from supposed peers; however, there were three primary changes. First, both males and females participated in the study. Second, participants were given an incentive to do well. Participants were told that their goal was both to drive quickly and to avoid accidents, with the best drivers earning a monetary prize. This pitted two motivations against each other: the desire to go fast and to avoid accidents. It was difficult for participants to do both, but both were necessary to do well and win the prize. Thus, participants had a reason to drive riskily, but such risk taking also had potential consequences, as it does in the real world.

Finally, the type of social influence the confederates used on the participants was manipulated to be either normative or informational. Normative influence tends to be more important when membership in the group is important (Kaplan, 1989). Informational influence tends to be more important when the task is difficult or ambiguous and there is incentive to do well (Baron, Vandello, & Brunsman, 1996). Because an incentive was provided and the confederate group consisted of strangers who would likely not see each other again, it was predicted that participants would be more sensitive to informational influence than to normative influence in Study 2.

Method

Participants

A total of 103 college students participated in the study. One student who reported not knowing how to drive and 4 students who reported playing driving-related videogames several times per week were deleted from the analyses. Finally, because of suspicion about the confederates, 9 students (9%) were deleted from the analyses, leaving a final sample of 89 participants (54 males, 35 females). The participants were primarily freshmen (64%) or sophomores (26%), and their mean age was 19.0 years ($SD = 1.2$). The majority of the sample (85%) was White, while 9% were African American, 2% were Hispanic, and 2% were Asian, which is representative of the population from which they were sampled.

Procedure

As in Study 1, each session had one actual participant and two confederates who pretended to be participants. Because gender of confederates had little effect on the results in Study 1, no effort was made to vary gender systematically. Instead, female undergraduates served as the confederates. Participants were told that the study was a simulated driving experience in which they were to attempt to drive quickly, yet safely. The experimenter explained that each participant in the group would get a chance to drive, and that the group that drove most quickly with the fewest accidents would be awarded $20 at the end of the semester. Thus, participants were challenged to balance the need for speed with the need for safety. As in Study 1, a rigged drawing led to the actual participant driving first (i.e., the confederates never drove). Before driving, participants completed a brief demographic questionnaire; and after driving, they completed measures of their perceptions of the driving experience.

The course and game settings were identical to those used in Study 1, except that the television screen sizes were all 19 inches (48.3 cm).[5] As the participant drove, the confederates engaged in a randomly determined dialogue.[6] In this study, there were four possible dialogues: pro-risk/normative influence, pro-risk/informational influence, anti-risk/normative influence, and anti-risk/informational influence. In the *pro-risk/normative influence* condition, confederates emphasized their desire to win the cash award, and encouraged the participant to drive faster (e.g., "I want the 20 bucks. Go faster . . . go faster; I'll be mad if someone else wins"). In the *pro-risk/informational influence* condition, confederates emphasized that they had special knowledge about the game, and that driving fast was the key to winning (e.g., "My friend plays these games all the time. He's really good and I've never seen him take his foot off the gas . . . so, if you want to win, you better go fast"; "You get more points from driving fast, it doesn't matter if you crash").

The anti-risk conditions used similar wording, but instead urged the participant to drive more slowly and carefully. In the *anti-risk/normative influence condition*, participants were told "I want the 20 bucks. Don't crash too much . . . go slower; I'll be mad if someone else wins." Finally, in the *anti-risk/informational influence* condition, participants were told "My friend plays these games all the time. He's really good, and he uses the brake a lot . . . so, if you want to win, you better not hit anything," and "You get more points if you don't hit stuff, it's more than just going fast."

[5]In Study 2, the average session time was 4 min (as compared to 3 min in Study 1), which resulted in a mean of 12 observations per participant in determining average speed.

[6]After the driving session, participants rated how much they had talked with the other participants (i.e., confederates). Amount of talking did not vary by condition ($p = .19$).

Measures

Once again, the primary dependent variables were number of accidents and maximum speed reached, both recorded by the videogame system. In addition, average speed was again calculated. Because of videotape malfunctions, data for 3 participants were not recorded.

Results

Most participants (64%) had little experience with driving-related videogames and reported playing them once per month or less. Experience with videogames and with driving games was equal across conditions (ps = .25 and .85, respectively). Overall, accidents (which included primarily minor infractions, as well as major collisions, as in Study 1) were fairly common ($M = 19.87$). Maximum speeds reached were likewise high ($M =$ 88.5 mph or 142.5 km/h), although average speed was not ($M = 33.3$ mph or 53.6 km/h). For each dependent variable, a Risk Condition × Influence Condition × Gender ANOVA was used to examine the effects of social influence. Table 4 depicts the mean for each variable.

For number of accidents, there was a main effect for risk condition, $F(1, 81) = 46.47$, $p < .001$, $d = 1.52$. As in Study 1, participants in the pro-risk conditions were influenced by the confederates to drive more riskily, leading to a greater number of accidents. There was also a main effect for gender, $F(1, 81) = 6.49$, $p = .01$, $d = 0.57$; female participants had more accidents than did males. The interaction between risk condition and gender was also significant, $F(1, 81) = 5.14$, $p = .03$. Pairwise comparisons revealed that although there were no gender differences in the anti-risk conditions ($p = .79$), there were significant gender differences in the pro-risk conditions. Specifically, both men and women in the pro-risk conditions had more accidents than did those in the anti-risk conditions, but women in the pro-risk conditions additionally had more accidents than did men in the pro-risk conditions (all ps < .01, ds > 0.70). Thus, women in the pro-risk conditions had the most accidents, on average (see Table 5).

One explanation for these results could be gender differences in experience with or skill at driving-related videogames, and males did report more experience than did females ($p = .02$, $d = 0.47$). Yet, a Risk × Influence × Gender ANCOVA that controlled for amount of time spent playing driving-related games did not change the results, which suggests that experience is not the entire explanation.

For maximum speed reached, there was a main effect for risk condition, $F(1, 81) = 10.06$, $p = .002$, $d = 0.71$. As in Study 1, those in the pro-risk

Table 4

Mean Maximum Speed, Average Speed, and Collisions by Risk Condition, Influence Condition, and Gender: Study 2

	Male						Female					
	Pro-risk			Anti-risk			Pro-risk			Anti-risk		
	N	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*
Informational influence	22			11			11			8		
Maximum speed		91.05	4.45		84.46	9.30		90.00	3.19		80.25	12.92
Collisions		21.50	6.60		12.64	6.27		30.36	17.22		11.75	6.41
Average speed		37.92	7.26		31.21	4.64		30.46	6.36		22.91	2.54
Normative influence	12			9			6			10		
Maximum speed		92.50	9.50		85.11	12.40		89.00	3.16		90.50	2.80
Collisions		22.25	10.66		12.89	4.51		32.67	7.03		14.90	4.33
Average speed		37.74	10.60		35.90	7.38		30.48	4.39		31.25	4.75

Table 5

Number of Accidents and Gender by Risk Condition: Study 2

	Pro-risk			Anti-risk			
	N	*M*	*SD*	*N*	*M*	*SD*	All
Male	34	21.77	8.11	20	12.75	5.41	18.43
Female	17	31.18	14.22	18	13.50	5.43	22.09
All		24.90			13.11		

Table 6

Average Speed (Miles Per Hour) and Type of Influence by Risk Condition: Study 2

	Pro-risk			Anti-risk			
	N	*M*	*SD*	*N*	*M*	*SD*	All
Informational	33	35.43	7.75	19	27.72	5.68	32.61
Normative	17	35.18	9.44	17	33.71	6.54	34.44
All		35.34			30.55		

conditions drove faster than did those in the anti-risk conditions. There were no other significant effects in predicting maximum speed. For average speed, however, there were several statistically significant findings. Participants in the pro-risk conditions drove faster than did those in the anti-risk conditions, $F(1, 78) = 6.04$, $p = .02$, $d = 0.56$. There was also a main effect for type of influence, $F(1, 78) = 4.26$, $p = .04$, $d = 0.47$, with participants in the normative influence conditions driving faster; and a main effect for gender, $F(1, 78) = 19.68$, $p < .001$, $d = 1.01$, with men driving faster than women. Finally, there was a risk by type of influence condition interaction, $F(1, 78) = 4.45$, $p = .04$ (see Table 6). Participants in the anti-risk/informational influence condition drove more slowly than did participants in the other three conditions (ps < .02, ds > 0.99); average speeds in the other three conditions were not significantly different from each other (ps > .44).

Discussion

As expected, the social influence manipulation was successful in Study 2, as it was in Study 1. Participants who were encouraged by peers to drive in a risky manner drove more riskily than did those who were encouraged to drive carefully. This effect was evident for the number of accidents and for maximum speed, as well as for average speed. These results suggest that within the confines of the study methodology, social pressure on driving behavior was clearly influential.

It is less clear why the number of accidents varied by gender, in addition to influence condition. Female participants who were encouraged to drive in a risky manner had more accidents than did any other group of participants. The significant gender difference did not disappear when we controlled for self-reported frequency of playing driving-related videogames. However, data were not collected on how well participants play videogames in general, or driving games in particular. The gender difference may be attributable to the women being less skilled at the driving game used in the study (cf. Brown, Hall, Holtzer, Brown, & Brown, 1997). Perhaps the men had better coordination with the game and the controls than did women, and this gender difference was revealed when participants were driving fast, but was hidden when participants were driving carefully in the anti-risk conditions.

Unexpectedly, the informational/anti-risk group had the lowest average speed, but the informational/pro-risk group did not have the highest average speed as predicted. This discrepancy may be a result of a ceiling effect for the pro-risk condition. Participants may have assumed that it was in their best interests to drive fast in order to win the competition. Concern about accidents—a consequence of driving fast—would be less important in the heat of the moment, as participants focused on completing the course in the fastest time by speeding. In other words, the benefits of risky driving outweighed the concerns (e.g., McKenna & Horswill, 2006). If participants began with the presumption that speed is most important, then it seems reasonable to believe that informational influence could be used to influence participants to drive more slowly, but not faster. They were already planning to drive fast, so neither informational nor normative social influence added to this tendency.

A limitation that must be acknowledged is that the study had a relatively small sample size, given its eight-cell design. Post hoc power analyses suggest that the study may have been underpowered (e.g., for maximum speed, observed power = .88 for risk condition, but < .37 for the other main effects and the interaction). It is possible that a larger sample may have revealed significant interaction effects.

General Discussion

In two studies, the driving behavior of young adults was intentionally and successfully affected by peers. In Study 1, young drivers were socially influenced using only verbal persuasion; peer "passengers" increased risky driving or reduced risky driving. Study 2 replicated that finding and also contrasted informational influence with normative influence. The results suggest that informational influence was more influential than was normative influence when paired with an anti-risk message.

In Study 1, normative versus informational influence was not deliberately manipulated. However, the instructions for the driving task provided by the experimenter might be considered a form of informational influence. In contrast, the peer confederates provided normative influence in making persuasive suggestions to participants about how they should be driving. For the anti-risk conditions, the normative and informational influences that participants received suggested the same behavior: safe driving. The influence differed in the pro-risk conditions: Normative influence was provided to drive in a risky manner, whereas informational influence favored safe driving. Participants in the pro-risk condition did drive riskily, which suggests that for these participants, normative influence from their peers was more influential than was the informational influence provided by the experimenter. Consistent with Study 1, in the pro-risk/normative influence condition of Study 2, the ongoing normative influence from the peer confederates had a stronger effect on participant behavior than did the brief informational influence from the experimenter.

Although plausible, given the arrangement of the current studies, the conclusion that normative influence outweighs informational influence should not be taken as definitive. In Study 1, for example, it may instead be the case that participants were most strongly affected by the type of influence that took place as the behavior was occurring. In other words, the informational influence from the experimenter given briefly at the beginning of the driving task may have been overshadowed by the more immediate, ongoing normative influence from the peer confederates. In addition, normative and informational influences were treated separately in these studies, but in real life, they are often intertwined; both may be present in an influence situation. For example, the influence manipulation used in Study 2 may be better thought of as normative influence versus normative influence plus informational influence. In the informational influence conditions, the confederates were using information as well as peer pressure to influence participants; while in the normative influence conditions, only pressure was used.

Limitations and Strengths

Real-life implications drawn from these studies are limited by the simulated driving situation. Although an effort was made to simulate real driving as much as possible, given financial, ethical, and practical constraints, we do not deceive ourselves in thinking that the participants were in the same frame of mind as a driver of an actual vehicle. However, the driving game participants played is more lifelike than are other games in the racing genre (Campbell, 2005; Game Rankings, 2005; Magrath, n.d.), and driving simulators can serve as an imperfect proxy for actual driving (Lee et al., 2003; Reimer et al., 2006).

In addition, if participants were thinking of the task as merely playing a videogame and the consequences were irrelevant, then it seems unlikely that participants in the neutral condition of Study 1 would drive safely. Because the risk level of participants in the neutral condition more closely resembled those in the anti-risk condition than those in the pro-risk condition, these studies should not be dismissed outright as being non-pertinent to actual risky driving. The relatively low level of risky driving exhibited by participants in the neutral condition suggests that participants were taking the driving task at least somewhat seriously, even though the driving occurred within the confines of a driving simulation.

Furthermore, experience playing videogames and experience playing racing games were not significantly correlated with maximum speed or number of collisions in either study (*p*s $> .09$). In their study of driving simulation, Takayama and Nass (2008) claimed

> One key piece of evidence that participants did, in fact, treat the simulator as an actual driving task, rather than a videogame, is that neither years of videogame experience nor number of hours per week spent playing videogames were associated with any of the measures, including the behavioral measures, in the study. (p. 180)

The accuracy of the study methodology in simulating a real-world experience was also reduced by the use of strangers as confederates. Except for very rare occasions (e.g., ride-sharing), passengers are people whom a driver knows. In addition, especially in Study 2, participants were aware of the benefit ($20) of winning the competition, but they did not face any penalties of being in an accident, other than not winning. In both studies, participants did not expect any punishment as a result of speeding or being in an accident. In real life, of course, there are numerous and serious costs associated with risky driving, and few benefits.

However, the current studies are rare in that they manipulated social influence and assessed a risk-related behavioral outcome. The ability of two strangers to affect significantly a peer's behavior underscores the importance of studying peer influence. If strangers can increase risky driving or improve safe driving within 4 min in a laboratory situation, policymakers should consider (and perhaps capitalize on) the likelihood that friends as passengers in a real car are even more influential.

The results of Study 2 indicate that normative influence from peers is more influential than is informational influence. This suggests that efforts to reduce automotive accidents should emphasize resisting peer pressure. Being susceptible to normative influence implies that people might know they should be driving safely, but take risks while driving to feel accepted by their risk-endorsing peers. Education about safe driving (informational influence) may not be very effective in preventing accidents when passengers are present. In educating young people about risk taking, it may be useful to warn them that they may be more likely to submit to dangerous social influence than they realize. Earning peer approval for risk taking is a potential benefit of giving in to ongoing social influence while driving that may overrule any potential risks.

Future Directions

As a point of departure from the current studies, future studies should assess gender differences in passenger approval of risky driving attitudes and behavior. Additional experimental research could pair male and female passengers who are in disagreement about risk taking to see what effect this has on risky driving behavior. Furthermore, the peers in the current studies were strangers to the participants, whereas actual passengers are likely to be friends, romantic partners, or family members. Because participants did not know their passengers well enough to know their attitudes regarding risky driving, they may have taken them at their (scripted) word. Additional research might vary the cohesiveness and/or familiarity of the peer group, vary the age of passengers, extend to more realistic situations than the one used in the current research, or use different normative and informational influence manipulations. Future research could also differentiate more clearly between driving that is careless versus reckless or aggressive driving, and then assess whether peer pressure is similarly influential on these various types of automotive risk taking. Importantly, future research should strive to simulate or assess driving behavior as accurately as possible, perhaps by including additional self-report measures of driving behavior that have been shown to correspond to real-life driving (e.g., West, French, Kemp, & Elander, 1993).

More generally, the current studies suggest some important implications for young-adult reckless behavior. One major concern highlighted by these studies is the negative impact that risk-seeking peers could have on driving behavior. However, participants were also influenced to drive in a less risky manner in the anti-risk conditions. Future research could further explore the circumstances (i.e., peer gender) that might ultimately lead to an understanding of and capitalization on positive influence.

Young people are notorious for engaging in risk-taking behavior (e.g., risky driving). Immature decision making, which includes discounting negative consequences in order to focus on benefits, is one factor that contributes to risk taking. As clearly demonstrated in the present studies, going along with peer influence while in the midst of a risk-conducive situation is another very important factor. Unfortunately, people may not be aware of their own tendencies to yield to the pressures of risk-endorsing peers while in a risky situation. Failing to recognize fully the recklessness of a situation may be the most dangerous aspect of risk taking. When the stakes are high, as in the case of driving an automobile, succumbing to social influence could result in tragedy. When faced with social pressure to drive riskily, logical beliefs about the carelessness of such behavior may take a back seat to acquiescence.

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