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# Perceptions of Sport-Utility Vehicle (SUV) Safety by SUV Drivers and Non-Drivers

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## ABSTRACT

The number of sport-utility vehicles (SUVs) on U.S. roads has grown substantially in recent years. Despite their popularity, SUVs have several potential disadvantages. The present study examined people's (N=370) perceptions of several SUV aspects (seeing above or around the SUV, collision involvement with smaller vehicles, headlights "blinding" other drivers, rollover, and low gas mileage) as a function of their SUV driving experience. Gas mileage was rated the most negative aspect of SUVs. Participants who had no SUV driving experience gave higher problem ratings to the SUV aspects than participants who drive an SUV or have some SUV driving experience. SUV drivers gave lower problem ratings than non-SUV drivers for aspects that could negatively affect non-SUV drivers (obscured line of sight, headlight glare, crash severity). Implications for driving safety and warnings are discussed.

**Keywords:** safety, beliefs, driver experience, risk communication.

## INTRODUCTION

In recent years, sport-utility vehicles (SUVs) have become a popular vehicle on U.S. roadways. In 2001 over 17% of all light vehicles sold in the U.S. were SUVs (Wards 2002). One reason for their popularity is their perceived safety advantages compared to other vehicles (Pittle 2000). Previously, consumer buying decisions had been guided more by style attributes like color and vehicle model than safety (e.g., Pittle 2000). However, more recently, greater attention has been given to aspects that increase safety (e.g., anti-lock brakes, air bags). With that focus, some consumers apparently buy SUVs because they believe them to be safer than passenger vehicles (Pittle 2000). However, recent accident statistics have shown that SUVs are prone to a specific type of accident: rollovers (U.S. National Highway Transportation Safety Administration [NHTSA] 2006). According to the NHTSA, rollovers account for more than 25 percent of all vehicle-related deaths (Muller and Welch 2000, NHTSA 2006). Compared to SUVs, passenger cars and minivans have a much lower probability of rollover accidents (Stoller 2000). Two factors are primarily responsible for SUV's relative instability and propensity for rollover: (a) they have a higher center of gravity than automobiles, and (b) they are more likely to be overloaded. The higher center of gravity makes them more likely to overturn with rapid lateral changes in direction. Also, despite their large cargo area, the load capacity of most SUVs is "light-duty." The weight and position of the load vehicle can affect handling and stability and could promote loss of control (Lee 2002).

While rollover accidents primarily present a risk to SUV drivers and their passengers as many are single vehicle crashes, other aspects of these vehicles are a safety concern to other vehicles on the road. These include the following:

(a) size: many SUVs are so large that it is often difficult for automobile drivers to see around them in traffic.

(b) higher profile: the headlight beams of SUVs tend to project at a higher level from the ground, causing both direct and reflected glare, negatively affecting dark adaptation and, more colloquially, "blinding" the eyes of motorists in front of them.

(c) greater height and mass: in collisions, SUVs inflict more damage to smaller passenger vehicles than occurs in collisions involving two passenger vehicles of similar mass. Crashes between SUVs and vans and other vehicles account for the majority of fatalities in vehicle-to-vehicle collisions (Jokschi 1998, Muller and Welch 2000, NHTSA 2006). Of all the fatalities that occurred in collisions between SUVs and cars, car occupants were 18.5 times more likely to be injured than the SUV occupants (Jokschi, 1998, Muller and Welch 2000, NHTSA 2006).

Despite these accident data and the increased negative publicity surrounding SUVs, they are still a popular choice with many consumers. Given this frequent exposure to negative information regarding SUV safety, why do consumers continue to purchase these vehicles? One explanation is that SUV drivers are either not highly aware of the SUV safety problems or ignore them. It is likely that SUV drivers have been exposed to media presentations about SUV safety issues at least as much or more than non-SUV drivers. Indeed, one might reasonably expect SUV drivers to be more familiar and attuned with various aspects of their vehicles including

safety issues because of their greater relevance due to ownership compared to non-SUV drivers. SUV drivers may be ignoring SUVs' negative aspects relative to persons who do not drive SUVs because they occur relatively infrequently (e.g., rollovers). Likewise SUV drivers may ignore other negative aspects because they are not directly affected by them (e.g., inability to see around an SUV or "blinding" headlights).

Non-SUV drivers' beliefs about SUVs may be affected in an opposite way because they are aware of the dangers of driving these vehicles and avoid their use. Non-SUV drivers' beliefs about SUVs might fit the availability heuristic somewhat better than SUV drivers. Non-SUV drivers may be more attuned because of the potential for greater negative consequences from SUVs to themselves (and in some cases to their passengers) relative to SUV drivers (e.g., a crash with less massive conventional passenger vehicle). Thus, for certain SUV aspects, non-SUV drivers may hold greater negative beliefs than SUV drivers due to their personal relevance in receiving negative effects to themselves.

The present study examined the responses of SUV and non-SUV drivers to determine whether they have different perceptions about the safety of SUVs. Participants were classified into one of two groups based on their responses to a question asking whether or not they had any experience driving SUVs.

Additionally, potential differences in demographic categories of gender, age, and college student vs. non-student were examined. Some research suggests that males tend to purchase and use SUVs more than females (Kweon and Kockelman 2003) and that younger males tend to be riskier drivers (e.g., being overrepresented as a group in crash statistics [Massie *et al.* 1997]). Age was examined because younger, less experienced drivers (teens and early twenties) tend to be over represented in crashes compared to other groups (Massie *et al.* 1997). Older drivers may have age-related declines in perceptual, cognitive and motor abilities compared to younger adults and may be more adversely affected by some SUV attributes (Ball and Rebok 1994, Janke 1994). The third demographic categorization: college student vs. non-student is a classification that overlaps with age (college students tend to be younger than the non-students) but it was included to determine if the responses differ in comparison between them as a check on the potential generalizability of the student scores.

## **METHOD**

### **SAMPLE**

Three hundred seventy adults participated. Of these, 246 were undergraduate students (mean age = 21.2 years, SD = 3.9) from North Carolina State University who participated for research credit. The other 124 were non-student adults from the communities of the Research Triangle Region area of North Carolina (mean age = 34.1 years, SD = 14.3).

The overall sample included 228 males (mean age = 25.3 years, SD = 10.6) and 142 females (mean age = 26.0 years, SD = 10.9). Ninety-eight percent of the participants reported that they had a valid driver's license. Only 9 (2.4%) reported that they did not have access to a vehicle to drive. Participants reported driving an average of 13262 miles (SD = 9633) (mean = 21343 km, SD = 15503) in the prior 12 month period.

#### **PROCEDURE**

Participants completed a questionnaire that included several categories of items. Some concerned various kinds of automotive vehicle driving-related experiences including primary vehicle driven (year, make and model). One section of the questionnaire was titled with the heading "Sport Utility Vehicles." The first item asked, "Do you drive or have you ever driven a sport-utility vehicle (SUV)?" Respondents marked either "yes" (1) or "no" (0) to the question. The remaining five items in this section were responded to using a rating scale. They were statements concerning potential negative aspects of SUVs. Participants were asked to rate the statements according "To what extent do you think the following may be a problem with SUVs?" The specific items listed were: (a) Seeing above or around the SUV, (b) Involvement in collisions with smaller vehicles with less mass, (c) Headlights "blinding" the eyes of motorists in front of them in smaller vehicles, (d) Rollover, and (e) Low gas mileage.

Ratings were made using a 0- to 8-point Likert-type scale with the even numbers labeled with the following text anchors: (0) "Not a Problem At All;" (2) "Somewhat a Problem;" (4) "A Problem;" (6) "Very Much a Problem;" and (8) "Extremely a Problem."

#### **RESULTS**

Analyses comparing SUV versus non-SUV drivers were based on grouping participants according to whether they reported having had any experience driving SUVs. Additional exploratory analyses used the classifications: (a) whether their reported primary vehicle could be classified as an SUV, and (b) whether their reported primary vehicle could be classified as being in the light truck category (which includes SUVs). Also, demographic categories of gender, age group, and college student vs. non-student were examined.

##### **DRIVERS WITH AND WITHOUT SUV DRIVING EXPERIENCE**

Two hundred fifty three (68.4%) participants indicated they had experience driving SUVs, while the other 117 (31.6%) had never driven an SUV. Ratings of these two groups were examined with respect to each of the five problem statements. Table 1 (see Appendix) shows the mean ratings as a function of SUV driving experience.

A 2 (SUV driving experience) x 5 (SUV aspects) mixed-model analysis of variance (ANOVA) showed that both main effects were significant,  $F(1, 368) = 16.63$ ,  $MSe = 14.06$ ,  $p < .0001$  and  $F(4, 1472) = 13.97$ ,  $MSe = 3.32$ ,  $p < .0001$ , for SUV driving experience and for SUV aspects, respectively. With respect to the first main effect, the means are shown on the bottom row of Table 1. Participants with no SUV driving experience gave higher problem ratings than participants with SUV driving experience. The means for the other main effect are shown on the right-most column of Table 1 (see Appendix). Comparisons among the SUV aspects' main effect means using Tukey's Honestly Significant Difference (HSD) test at  $p < .05$  showed that participants were most concerned with low gas mileage and that this aspect was rated significantly higher compared to all other statements except for headlights "blinding" other drivers. The aspect of headlight "blinding" other drivers was rated significantly more of a problem than the remaining aspects except for collision with smaller vehicles. Collision with smaller vehicles was given significantly higher problem ratings than seeing above or around SUVs, but not significantly different from rollover. The latter two aspects (i.e., seeing above or around SUVs and rollover) did not differ.

The ANOVA also showed that the factors of SUV driving experience and SUV aspects significantly interacted,  $F(4, 1472) = 10.28$ ,  $MSe = 3.32$ ,  $p < .0001$ . The means are shown within the cells of (see Appendix) 1. Tests of simple effects showed that perceptions of three of the five SUV aspects significantly differed as a function of SUV experience. Experienced SUV drivers were less concerned than inexperienced SUV drivers about the aspects of: (1) seeing above or around the SUV,  $F(1, 368) = 25.04$ ,  $p < .0001$ ; (2) collisions involving smaller vehicles,  $F(1, 368) = 19.83$ ,  $p < .0001$ ; and (3) headlights "blinding" other drivers,  $F(1, 368) = 18.02$ ,  $p < .0001$ . The other two problem statements did not differ as a function of SUV driving experience.

#### PRIMARY SUV DRIVERS VERSUS DRIVERS OF NON-SUV VEHICLES

Participants were also asked what type of vehicle they drove most often. Fifty-three of the 370 participants indicated SUVs were their primary vehicle. Cell means for SUV driving experience and SUV aspects are shown in Table 2.

A 2 (SUV driving experience) x 5 (SUV aspects) mixed-model analysis of variance (ANOVA) showed that both main effects were significant,  $F(1, 368) = 28.52$ ,  $MSe = 13.64$ ,  $p < .0001$ , and  $F(4, 1472) = 22.76$ ,  $MSe = 12.02$ ,  $p < .0001$ , for SUV driving experience and SUV aspects, respectively. There was also a significant interaction,  $F(4, 1472) = 3.56$ ,  $MSe = 12.02$ ,  $p < .01$ . The pattern of means and simple effects analysis were similar to the preceding analysis, with one exception: there was also a significant difference in that participants who primarily drive SUVs rated SUV rollovers ( $M = 3.87$ ) significantly less of a problem than those who primarily drive other vehicles ( $M = 4.76$ ),  $F(1, 1472) = 6.61$ ,  $MSe = 5.43$ ,  $p < .01$ . One other comparison suggested a trend that did not attain the conventional criterion level for significance of  $p < .05$ . Participants who drive SUVs as their primary vehicle ( $M = 5.00$ ) rated the problem of low SUV gas mileage somewhat

less severely than primary drivers of other kinds of vehicles ( $M = 5.63$ ),  $F(1, 1472) = 3.36$ ,  $MSe = 5.43$ ,  $p < .07$ .

#### OTHER DEMOGRAPHICS

The relationship of three demographic factors (gender, age, and college student vs. non-college student status,) with respect to SUV problem perceptions was examined. Three separate mixed model ANOVAs were used. Each analysis utilized a single demographic category as a between-subjects (group) variable together with SUV aspects as the within-subjects (repeated measures) variable.

The ANOVA involving gender showed no main effect of gender or an interaction ( $ps > .05$ ). The ANOVA showed the significant main effect of SUV aspects,  $F(4, 1472) = 22.56$ ,  $MSe = 3.41$ ,  $p < .0001$ , yielding the same pattern described earlier.

Age was also analyzed in a similar manner. A median split was used to divide participants into two, approximately equal groups of younger ( $M = 19.9$ ,  $SD = 1.2$ ) and older ( $M = 31.6$ ,  $SD = 12.8$ ) participants. The main effect of age group failed to reach the conventional criterion for significance but suggested that, in general, the older group ( $M = 4.99$ ) perceived the SUV aspects to be more problematic than the younger age group ( $M = 4.69$ ),  $F(1, 368) = 2.99$ ,  $MSe = 14.6$ ,  $p = .08$ . However, there was also a significant interaction,  $F(4, 1472) = 3.46$ ,  $MSe = 3.38$ ,  $p < .01$ . Simple effects analyses showed one significant difference: the older group ( $M = 4.70$ ) rated seeing above and around the SUV as a greater problem than the younger group ( $M = 3.94$ ),  $F(1, 1472) = 9.45$ ,  $MSe = 6.62$ ,  $p < .01$ .

The ANOVA with college students vs. non-students as the grouping factor showed that both main effects were significant,  $F(1, 368) = 5.97$ ,  $MSe = 14.46$ ,  $p < .05$  and  $F(4, 1472) = 22.72$ ,  $MSe = 3.39$ ,  $p < .0001$ , for student vs. non-students and SUV aspects, respectively. In general, college students ( $M = 4.68$ ) viewed the SUV aspects to be significantly less problematic than non-students ( $M = 5.14$ ). There was also a significant interaction,  $F(4, 1472) = 2.97$ ,  $MSe = 3.39$ ,  $p < .05$ . Simple effects analysis showed that college students rated two SUV aspects significantly less problematic than non-students: (a) seeing above and around the SUV ( $Ms = 3.99$  and  $4.95$ , for college students and non-students, respectively),  $F(1, 1132) = 1368$ ,  $MSe = 5.60$ ,  $p < .0001$ , and (b) collisions involving smaller vehicles ( $Ms = 4.55$  and  $5.19$ , for college students and non-students, respectively),  $F(1, 1132) = 5.89$ ,  $MSe = 5.60$ ,  $p < .02$ .

#### DISCUSSION

SUVs are a popular vehicle type in the U.S. that offers both benefits and disadvantages to consumers. Benefits include greater ground clearance for off-road driving, higher seat height affording a better view of the road, and generally greater passenger and cargo space compared to conventional passenger cars. The disadvantages include poor gas mileage and rollover propensity, among others.

Perceptions of SUV disadvantages as a function of driving experience, as well as several demographic variables, were examined in the present study.

Based on the overall mean ratings and scale anchors, participants viewed all of the SUV aspects listed on the survey as being problematic. Because participants were required to assess how each of five safety aspects is a "problem," it is important to note that participants may have varied in their interpretation of this term. Previous safety research by Wogalter *et al.* (1991) suggests that participants would rate the items according to severity of injury rather than frequency (probability) of injury. However, of the items listed in this study, poor gas mileage was perceived by both SUV drivers and non-SUV drivers as the most problematic. The poor gas mileage issue was probably highly salient because of rising fuel prices in recent years which has drawn media attention to SUVs' relatively-high gas consumption per mile relative to conventional passenger cars. During much of the growth period for sales of SUVs, gasoline was relatively inexpensive and the difference in cost to fuel SUVs compared to cars was inconsequential. With rising gas prices and a greater awareness of the limits of oil reserves, and international conflicts among nations with larger supplies of oil, it is likely that drivers of both SUVs and non-SUVs are aware of poor gas mileage being a problem.

When asked to assess the aspects associated with safety, drivers of SUVs tended to have less negative perceptions of them. This was true in all three methods of categorizing SUV driving experience. The strongest effects noted were for those SUV aspects that could be classified as factors affecting other people, particularly non-SUV drivers and their passengers. In other words, from the perspective of the SUV driver, those aspects affecting other people (not themselves) were not as viewed as problematical relative to the viewpoint expressed by non-SUV drivers in their ratings. Statistically significant differences were consistently found between SUV and non-SUV drivers for three of the aspects: (1) seeing above or around the SUV, (2) collisions with smaller vehicles, and (3) headlights "blinding" other drivers.

Somewhat weaker differences were found for the two items that more directly affect SUV drivers and their passengers (but still could affect other people). SUV drivers had significantly lower problem ratings than non-SUV drivers for rollover for two of the three SUV driving experience classifications. Gas mileage showed the same trend but never reached conventional statistical significance.

The results suggest that SUV drivers are less critical about some SUV aspects than non-SUV drivers. A specific, definitive reason for the differences cannot be made at this point; further investigation is necessary to select among alternative explanations. However, several potential explanations can be offered. One is that SUV drivers might have had some or all of their beliefs regarding SUVs *before* they drove or purchased an SUV. That is, drivers may have already established their beliefs before using or purchasing an SUV or other vehicle types. Alternatively, their perceptions might have changed *after* they drove or purchased an SUV. Another, somewhat different, kind of explanation is that SUV drivers may have failed to pay attention to, or in some way ignored, negative information—before or after driving an SUV. Indeed one reasonable expectation expressed in the Introduction section is that SUV drivers probably know *more* about SUVs, in general, than non-SUV drivers. Although most SUV drivers have probably heard



negative information, they may judge it to be less credible, perhaps in part due to other perceived benefits they derive from SUVs (e.g., generally greater passenger and cargo space than passenger cars). SUV drivers may focus more on the positive aspects of SUVs, believing that those aspects outweigh the negative aspects, than non-SUV drivers.

Non-SUV drivers have a different pattern of judgments than the SUV drivers with respect to some of the safety-related aspects because they are more negatively impacted by them than the SUV drivers are. For three of the five negatives listed, SUV drivers could have a safety advantage over non-SUV drivers. Obscured vision, greater risk in collisions with an SUV and headlights blinding are aspects that could detrimentally affect drivers of other (smaller) vehicles. SUV drivers may be less aware of or ignore these negative aspects because they are not adversely affected, their relevance is less, and/or they see them as advantages over other vehicle drivers. That is, some SUV drivers may realize that these aspects represent advantages of SUVs over other vehicles (non-SUVs), in which they are better off (i.e., less likely to be injured) in collisions involving smaller vehicles. Consequently they do not rate them as problematic as non-SUV drivers.

Several additional concepts can also be used to explain the belief differences between driver groups. For example, the perseverance effect (e.g., Anderson *et al.* 1980, Ross *et al.* 1975) says that beliefs, once formed, are relatively stable and resistant to change. SUV drivers may form positive attitudes and beliefs about the vehicles before or soon after they purchase an SUV. Therefore, despite the presence of evidence to the contrary, they maintain relatively positive perceptions of SUV safety. The third person effect (Perloff 1993) provides another explanation. One example of this effect was shown by Adams *et al.* (1998) who found that people often report that injury events are more likely to happen to other people than to them. Applying this to the findings in the present study, SUV drivers might believe that negative outcomes associated with SUVs are much more likely to occur to other drivers, not themselves. SUV drivers may be less concerned about safety-related problems simply because they are less directly affected by them compared to passenger car drivers, or in other words, they may be taking an egocentric perspective. This perspective, however, would not explain the concurrent failure to find significant differences between groups for low gas mileage, and to a lesser extent, rollover.

In addition, a few demographic differences were noted in the age and student/non-student analyses. The pattern of results between age and student/non-student analysis were relatively consistent such that the main finding indicated that college students and younger adults rated seeing around an SUV and collisions involving an SUV to be less problematic than non-students and somewhat older adults. Two explanations can be offered for these findings. They may partly reflect a mindset of invulnerability (Finn and Bragg 1986) that has been found in earlier research involving younger versus older adults. At the same time, older, non-students have more driving experience, and consequently, may be more aware of the problems than less-experienced, younger college students. Headlights blinding other drivers was rated more of a problem by older participants than the younger participants. This concurs with research indicating that older adults have



more problems with glare during night time driving than younger adults (Ball and Rebok 1994, Janke 1994).

Future research could explore several related issues. One is whether people are considering the economic and geopolitical context in their judgments of vehicle preferences and beliefs. Other issues of potential interest concern people's beliefs about safety-related aspects of their vehicles, the effects of educational efforts, and the influence of governmental regulations and industry standards on safety.

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Table 1. Mean problem ratings of SUV aspects by drivers who have driven and who have not driven an SUV (SDs in parentheses).

SUV Aspects	SUV Driving Experience		Mean
	No	Yes	
Seeing above or around the SUV	5.27(2.27)*	3.87 (2.62)	4.31 (2.60)
Collision involvement with smaller vehicles	5.54(2.11)*	4.41 (2.34)	4.76 (2.33)
Headlights "blinding" other drivers	5.70(2.33)*	4.57 (2.42)	4.92 (2.45)
Rollover	4.80(2.20)	4.55 (2.18)	4.63 (2.19)
Low gas mileage	5.47(2.52)	5.58 (2.20)	5.54 (2.30)
Mean	5.36(2.28)*	4.59 (2.36)	
n	117	253	

Note. Higher scores indicate more negative perceptions of SUV problems.

\* $p < .05$  between the two groups on SUV driving experience.

Table 2. Mean problem ratings of SUV aspects by participants who drive SUVs versus participants who primarily drive other kinds of vehicles (SD in parentheses).

SUV Aspects	SUV Driving Experience	
	Primary Vehicle is <i>not</i> SUV	Primary Vehicle is SUV
Seeing above or around the SUV	4.55 (2.56)*	2.91 (2.38)
Collision involvement with smaller vehicles	4.99 (2.48)*	3.42 (2.20)
Headlights "blinding" other drivers	5.18 (2.42)*	3.38 (2.04)
Rollover	4.76 (2.16)*	3.87 (2.23)
Low gas mileage	5.63 (2.28)	5.00 (2.41)
Mean	5.02 (2.34)*	3.71 (2.25)
n	317	53

Note. Higher scores indicate more negative perceptions of SUV problems.

\* $p < .05$  between the two groups