

# IDENTIFYING WHAT DRIVERS KNOW ABOUT THE HAZARDS OF AIR BAGS TO CHILDREN

Eric F. Shaver and Michael S. Wogalter

*Department of Psychology  
North Carolina State University  
Raleigh, NC 27695-7801 USA*

## ABSTRACT

The purpose of air bags is to prevent serious injury of occupants involved in vehicular accidents. Although lives have been saved by air bags, certain subpopulations have a greater risk for personal injury or death; namely, children and small-stature adults. The present research had two parts. The first was a survey in which participants were asked the minimum recommended age limit for children in the front seat according to the visor warning in vehicles with passenger-side air bags. The results indicated that on average minimum age reported by participants ( $M = 8.8$  yrs,  $SD = 3.4$ ) is significantly lower than the recommended age of 13,  $t(244) = -23.94$ ,  $p < .0001$ . The second part was a field study that evaluated whether young children were (a) located in the front seat of vehicles equipped with passenger-side air bags, and (b) if the occupants of the vehicle wore their seat belts. The results indicate that 16% ( $n = 24$ ) of the children being dropped off or picked up at an elementary school rode in the front seat of vehicles equipped with passenger-side air bags. Also, 11% ( $n = 16$ ) of the drivers and 27% ( $n = 56$ ) of the children were not wearing seat belts. Implications of the study with respect to warnings are discussed.

## INTRODUCTION

The express purpose of vehicle safety devices, such as air bags and seat belts, is to save lives and prevent injuries. According to the National Highway Transportation Safety Administration (NHTSA), air bags have been credited with saving the lives of 6377 people (NHTSA, 2000). Of those saved, 5380 were drivers and 997 were seated in the front-right passenger side of the vehicle. Although air bags have saved numerous lives, they have also been linked to the deaths of at least 170 people (NHTSA, 2000). The majority of these deaths have been in two subpopulations: children and small-stature females. The present research focuses on the prevention of injury in children by deploying passenger-side air bags in motor vehicle accidents.

In general, the primary strategy for the control of hazards is to attempt to design out or eliminate the risk. According to Parents for Safer Airbags (PSAB), there are two available solutions for the problem: (1) increase the threshold Delta V when air bags will deploy to 15 mph, and (2) require the use of "depowered" air bags (PSAB, 1999). The vast majority of the injuries and deaths attributable to air bags have occurred in low-speed accidents (PSAB, 1999) with vehicles equipped with first generation designs. Although second and third generation air bags

("smart" air bags) have taken the abovementioned recommendations into consideration, there are still millions of vehicles on the road equipped with the older design. As such, people must be warned about the potential hazards that air bags present to certain groups of individuals.

As of February 25, 1997, NHTSA required the use of attention-getting warning labels (e.g., use of color, large signal word, and pictorial symbol) in vehicles manufactured for the U.S. market place. The warning also includes statements like "children 12 and under can be killed by the air bag." In addition, some pre-1997 vehicles with passenger-side air bags have been retrofitted with sticker labels that were sent to most registered owners. Despite its incorporation into many cars with air bags, this does not mean that people have attended to and processed the content of the warning. It is with this in mind that the present research was conducted.

In the first study, as part of a large questionnaire, participants were asked the minimum age a child should be before sitting in the front seat of a vehicle equipped with a passenger-side air bag. A second study sought to determine if people were complying with the NHTSA recommendation to have children seated in the rear seats of vehicles equipped with passenger-side air bags. The study also evaluated the seat belt usage of all occupants of each vehicle.

## STUDY 1

## Method

**Participants.** Two hundred forty-five individuals from the Raleigh, North Carolina area participated. The sample was composed of 144 males ( $M = 25.22$  yrs,  $SD = 11.17$ ) and 101 females ( $M = 26.05$  yrs,  $SD = 11.37$ ). Data were collected by students in an undergraduate ergonomics course at North Carolina State University as part of a class project assignment.

**Materials.** Each participant completed a comprehensive survey. The survey covered a variety of topics including items on demographics, vehicle use and maintenance, and opinions on public restrooms. The present study focuses on one question pertaining to the age when children are permitted to sit in the front seat of a vehicle equipped with a passenger-side air bag. Specifically, the question asked "At what age are children permitted to sit in the front seat of a vehicle with a passenger side airbag?"

**Procedures.** Participants were given the questionnaire and asked to complete it. However, because of the survey's length, some participants who started it, failed to completely respond to all of the items. Of the original 405 surveys distributed, 40% ( $n = 160$ ) were not analyzed based on the following criteria: (1) incomplete demographic data, (2) more than 25% of the survey was left incomplete, and (3) participants did not provide any response to the air bag question.

## Results

Descriptive statistics for the responses are provided in Table 1. The table also shows frequencies for the reported permitted age, divided into three categories: 11 years old and younger, 12 years old, and 13 and above. The breakdown of age by number of observations is provided in Table 2.

Table 1

*Mean Reported Age at Which it is Permitted for a Child to Sit in the Front Passenger Seat*

	Descriptive Statistics				
	<i>M</i>	<i>SD</i>	≤ 11	12	≥ 13
Age	8.8	3.4	150	79	16

Table 2

*Age of Child by the Number of Responses*

Age	Number of Responses	% of People Responding
0	2	0.8
1	1	0.4
2	3	1.2
3	7	2.8
4	9	3.6
5	33	13.4
6	25	10.2
7	17	6.9
8	26	10.6
9	1	0.4
10	22	8.9
11	4	1.6
12	79	32.2
13	8	3.2
14	5	2.0
15	1	0.4
16	2	0.8

## Discussion

According to the National Safety Council (2001), children 12 years of age and younger should sit in the backseat of vehicles equipped with passenger-side air bags. Additionally, the new warning label mandated in February 1997 makes the same recommendations. In other words, the "correct" response to the air bag question in this study is 13 years old. The results indicate that this is not what people report. The mean age reported by participants ( $M = 8.8$  yrs,  $SD = 3.4$ ) was significantly less than the government's (NHTSA) and NSC's recommended age of 13,  $t(244) = -23.94$ ,  $p < .0001$ .

Of the 245 participants, 93.5% ( $n = 229$ ) of people provided "incorrect" responses (i.e., answers that were less than 13 years of age). In Table 2, the results indicate that 32.2% ( $n = 79$ ) of people reported that children should be 12 years of age or older. There are several reasons for the relatively large number of people who gave the number 12 for their response. First, it possibly indicates a memory bias. People might be remembering the number "12" from the newer air bag warning label, which states that "children 12 and under can be killed by the air bag." Older versions generally do not provide any age information. Another reason why the most reported number was "12" instead of "13"

could be due to the wording on the warning label. The label gives the number 12 instead of 13, within the statement. Lastly, another reason for reporting age 12 might be because this age is commonly use as a demarcation point between child and teenage adolescence.

Of the 16 people who provided answers of 13 years of age or above, only 3.3% ( $n = 8$ ) provided the correct answer of 13. Although the other 8 individuals were incorrect, safety is not compromised by its use in determining passenger seating.

**STUDY 2**

This study sought to determine the number of children located in the front seat of vehicles equipped with passenger-side air bags and the seat belt usage of all occupants in each vehicle.

**Method**

*Participants.* One hundred fifty individuals from the Raleigh, North Carolina area participated. Due to the study being an unobtrusive, observational field study, demographic data was not collected.

*Materials.* Two data collection forms were created. The first form included (a) whether the driver was belted or not, (b) location of the child in vehicle, and (c) if the child was belted or not. The sheet allowed data collection for up to three children per vehicle. The second form included (a) the license plate number and (b) vehicle description.

*Procedures.* Three observers watched vehicles that were being used to drop children off at a local Raleigh-Durham, North Carolina area elementary school. The age of the students ranged from 5 to 11 years. Two observers used the first form to capture the requisite data and to allow for calculation of inter-rater reliability, while a third observer completed the second form. The observers were located approximately 25 meters before the school’s designated drop off site to lessen the chance that children would have removed their seat belts in preparation for exiting the vehicle.

For a vehicle to be counted, it had to meet the following criteria: (a) only one adult in the vehicle, (b) the experimenters had to be able to verify whether the occupants were wearing seat belts or not, and (c) the experimenters were able to record all necessary information for both forms. In several cases ( $n = 53$ ), more than one child was located in the vehicle. In these instances, data was collected for all occupants.

Once the data was collected, the license plate numbers, for each vehicle, were submitted to the North Carolina Department of Motor Vehicles to determine

the make, model, year, and vehicle identification number (VIN) for each. Through the use of a VIN decoding program, it was possible to determine which vehicles were equipped with passenger-side air bags.

**Results**

The location of the child in the vehicle by the passenger-side air bag is provided in Table 3. Of the 24 children located in the front seat of vehicles equipped with passenger-side air bags, 33.3% ( $n = 8$ ) were not wearing seat belts.

The seat belt use by both drivers and all the children in the vehicle (regardless of location) is provided in Table 4. Of the 56 children who were not belted, 76.8% ( $n = 43$ ) were located in the front seat.

Table 3

*Passenger-Side Air Bag by Child Location*

Child Location	Passenger-Side Air Bag n (%)	
	Not Equipped	Equipped
Front	10 (6.7%)	24 (16%)
Back	21 (14%)	95 (63.3%)
	31 (20.7%)	119 (79.3%)

Table 4

*Seat Belt Use by Occupant*

Occupant	Seat Belt Use n (%)	
	Yes	No
Driver	134 (89.3)	16 (10.7)
Child	152 (73.1)	56 (26.9)

**Discussion**

The results showed that 16% ( $n = 24$ ) of the children observed were located in the front seat of vehicles equipped with passenger-side air bags. According to Glass, Segui-Gomez, and Graham (2000), children belted in the front seat of vehicles equipped with passenger-side air bags have a 31% increased risk

of death compared to vehicles with no passenger-side air bag.

The results also showed that 33.3% ( $n = 8$ ) of the 24 children were unbuckled in the front seat of vehicles equipped with passenger-side air bags. According to Glass et al. (2000), passenger-side air bags increase the likelihood of fatality for unrestrained children by 84%.

A secondary focus of the study was to evaluate the behavior of the vehicle occupants in reference to seat belt use. As can be seen in Table 4, 89.3% ( $n = 134$ ) of the drivers and 73.1% ( $n = 152$ ) of the children were observed wearing their seat belts. The lower compliance of children compared to drivers could be due to some originally buckled children, in preparation for vehicle exit, might have unbuckled themselves prior to measurement.

Overall, the number of children located in the front seat of vehicles equipped with a passenger-side air bag was lower than expected and seat belt compliance was higher than expected. Although at first glance these numbers appear encouraging, indicating communications regarding safety of children are working to some extent, there are some limitations. First, data was collected at one of the most affluent areas in the Research Triangle Area. This is indicated by the large percentage of luxury cars, 30% ( $n = 45$ ) that dropped or picked up the children. One would expect these individuals to have more education than individuals from a lower socio-economic area. As such, it would not be surprising to find in another study involving persons from a lower socio-economic area to have a larger number of children located in the front seat and lower seat belt compliance. Additional research will need to determine this.

### GENERAL DISCUSSION

People must be made aware of the dangers of locating young children, small adults, and older adults in vehicles equipped with first generation passenger-side air bags. While some people may be getting the message, not all are. The present findings indicate that many people do not know that children 12 years of age and younger should sit in the backseat of vehicles equipped with passenger-side air bags, 16% ( $n = 24$ ) of the children were located in the front seat of passenger air bag equipped vehicles, and others were unbuckled. This suggests that still many people are not using safe practices. Different, perhaps more strident risk messages would seem to be needed.

Even though current U.S. regulation do not allow additional safety messages on the visor, the NHTSA Federal Motor Vehicles Safety Standards [FMVSS] 208 does allow for the use of other types of warnings (e.g., a label in another place in the vehicle). Another way to increase awareness and understanding is through the use of a comprehensive education program. This could include public service announcements in the broadcast and print media. The announcements could explain the need for children to be located in the backseat of vehicles equipped with passenger-side air bags as well as illustrating the consequences for not doing so (i.e., death of the child).

The more knowledge people have the more likely they will be to make an informed decision when it comes to children and air bags. Hopefully, in the end this will lead to a decrease in lives lost and injuries resulting from air bags.

### ACKNOWLEDGEMENTS

The authors would like to thank Kenya Freeman for her help in the creation and distribution of the survey as well as helping to collect the data for the field study.

### REFERENCES

- Glass, R.J., Segui-Gomez, M., & Graham, J.D. (2000). Child passenger safety: Decisions about seating location, airbag exposure, and restraint use. *Risk Analysis*, 20, 521-527.
- National Highway Transportation Safety Administration, [NHTSA]. (1997). *The air bag that saves your life could kill your child* [Brochure]. Washington, DC: Department of Transportation.
- National Highway Transportation Safety Administration, [NHTSA]. (Dec, 2000). *Air bag fatality and serious injury summary report*. Washington, DC: Department of Transportation.
- National Highway Transportation Safety Administration, [NHTSA]. (2001). *Federal motor vehicle safety standards: Occupant crash protection [49 CFR 571.208]*. Washington, DC: Department of Transportation.
- National Safety Council, [NSC]. (March, 2001). *Air bag and seat belt safety fact sheet*. Itasca, IL: National Safety Council
- Parents for Safer Air Bags, [PSAB]. (1999, 2nd ed.). *The air bag crisis: Causes and solutions*. Washington, DC: Parents for Safer Air Bags.