# WARNING: IN CARS, PARENTS MAY BE HAZARDOUS TO THEIR CHILDREN'S HEALTH

## The Hazards of On-Lap Travel

Allan F. Williams, Ph.D.

April 1978

From: Insurance Institute for Highway Safety, Watergate 600, Suite 300, Washington, D.C. 20037

# WARNING: IN CARS, PARENTS MAY BE HAZARDOUS TO THEIR CHILDREN'S HEALTH

## The Hazards of On-Lap Travel

Allan F. Williams, Ph.D.

## Abstract

In car crashes, children traveling on laps cannot be adequately restrained, and moreover are susceptible to serious injuries caused by their being crushed by the persons holding them. Case studies illustrate ways in which this happens and types of injuries that result. Survey data are presented indicating that on-lap travel is very common, especially involving infants. Difficulties encountered in attempts to reduce this practice by legislation and educational programs are described. It is suggested that pediatricians and other physicians have an important role to play in discouraging on-lap travel and in encouraging other techniques which reduce crash injuries to children.

# WARNING: IN CARS, PARENTS MAY BE HAZARDOUS TO THEIR CHILDREN'S HEALTH

## The Hazards of On-Lap Travel

Allan F. Williams, Ph.D.

It has been well documented that parents typically place their children in jeopardy during car travel by allowing them to travel unrestrained. In a survey conducted at fourteen amusement areas and shopping centers in Maryland, Massachusetts and Virginia in 1974, 93% of 8,893 children less than ten years of age observed in cars exiting from these sites were traveling without any restraints at all, or were improperly restrained against possible crash injuries.[1] Although parents and others who transport children bear much of the responsibility for seeing that they are restrained, it was found in this survey that drivers on average took better care of themselves with crash restraints than of the children in their vehicles. When drivers were unrestrained, virtually all of the children in their cars were unrestrained. When drivers were wearing seat belts, more than 75% of the children in their cars were unrestrained. Even when the driver was the child's parent, was wearing a seat belt, and was a college graduate, 72% of their sons and daughters traveling with them were unrestrained.

Many parents and other adult occupants of vehicles jeopardize child travelers in another way. Crash injuries caused or aggravated by occupant-to-occupant contact have been found to be a common occurrence.[2] Children—including those few who are restrained—are particularly vulnerable

to such injury, because parents and others tend to travel with children in such ways that they are likely to strike and crush them against vehicle structures in crashes.

When vehicles crash into other vehicles or objects and are abruptly halted, their unrestrained occupants continue at the speed the vehicles were traveling. They do not stop until they strike interior structures, other occupants, or, if they are ejected, the pavement or other surfaces outside their vehicles. The faster the crash speeds, and the shorter the distances over which the vehicles decelerate, the greater the violence with which these contacts are made.

Contact among vehicle occupants can occur with many types of crash and seating positions, but is more likely in certain situations. For example, when a forward moving vehicle is struck from the side, it moves sideways away from the impact point toward its unrestrained occupants. Occupants on the impact side are subsequently contacted by the door and moved sideways with the vehicle toward occupants on the opposite side, and are thus susceptible to injury-producing contact with them. Unrestrained drivers who transport children in the front seat subject them to this possibility, and cases have been reported in which children have been fatally injured by being crushed between the right front door and the driver.[2]

Injurious contact in crashes is particularly likely to result when children travel on the laps of adults, yet this is a very common mode of travel, particularly for infants. Table 1 presents data on on-lap travel from the 1974 observational survey.[1] Of those less than

Table 1

On-lap Travel of Children in Automobiles Observed at 14 Amusement Area and Shopping Center Exits in Three States, 1974

| Age | # Observed | Traveling on Someone's Lap | |
|---|---|---|---|
| | | No. | (%) |
| < 1 | 344 | 150 | (44%) |
| 1 | 520 | 135 | (26%) |
| 2 | 980 | 130 | (13%) |
| 3 | 1,018 | 72 | ( 7%) |
| 4-9 | 5,621 | 98 | ( 2%) |

one year of age, almost half traveled this way, as did one quarter of the one-year olds, and decreasing though still significant numbers of older children.

Traveling with a child on one's lap, or in arms, is potentially lethal for the child whether or not the adult and/or child are restrained by a seat belt. Table 2 shows cases of on-lap travel in the 1974 survey in relation to restraint of the child and the holder. By far the most common pattern is for both to be unrestrained. In a few cases both are restrained by the same seat belt, and in some cases the holder alone is using a seat belt.

None of these practices affords protection against crash injuries, and each carries with it the likelihood of children being injured by the persons holding them. In the typical situation in which both are unrestrained, neither the movement of the child nor the holder is initially limited in a crash. In frontal and other crashes in which there is a forward velocity component, both continue to move forward as the vehicles decelerate and are likely to be injured by contact with interior vehicle structures. In addition, because of their relative positions, the child is likely to be crushed between these vehicle structures and the holder, with additional or more severe injuries the result. It should be noted that pregnant women who are unrestrained in crashes may subject their unborn children to similar crushing-type injuries.

In the relatively infrequent cases of on-lap travel in which the adult is restrained but the child is not, the adult's arms—even if clasped firmly around the child—do not provide adequate crash protection. Crash forces are commonly of sufficient magnitude that the bodies of

Table 2

Use of Seat Belts by Children on Laps and by the Persons Holding Them

| Seat Belt Use | | | |
|---|---|---|---|
| Children on Laps | Holders | N | (%) |
| No | No | 512 | (88%) |
| No | Yes | 53 | ( 9%) |
| Yes | Yes | 20 | ( 3%) |
| Yes | No | —* | |
| Total | | 585 | (100%) |

*Not physically possible

children experience forward forces of several hundred pounds and cannot be restrained by human arms. In addition, it is known that in frontal crashes adults wearing lap belts or lap and shoulder belts often contact vehicle structures ahead of them, because of such factors as belt stretch, belt breakage, or belts being worn loosely. Thus, even when adults are restrained, they may inflict crushing-type injuries to unrestrained children on their laps.

The only instance of on-lap travel in which the child's motion in a crash will be effectively limited—when both child and holder are restrained by the same seat belt—is particularly dangerous in that harmful contact is virtually guaranteed. In a crash, a child thus restrained would be likely to sustain serious abdominal injury, as a result of being compressed between the seat belt and the much heavier forward-moving adult.

In a review conducted for the present report of 53 cases from the files of the multidisciplinary accident investigations of the National Highway Traffic Safety Administration[3], in which children traveling on laps were injured, it was found that injuries due to probable or definite occupant-to-occupant contact were reported in 22 (42%) of the cases. These range from minor injuries to the child such as lacerations, abrasions, or contusions, caused by direct contact with the adult, to fatal injuries resulting from multiple crushing trauma.

In 10 of the 14 crashes in which children on laps were severely injured or killed, the injuries were reported to be caused or aggravated by contact with other vehicle occupants. Examples of such cases are as follows:

1. A 1965 Chevrolet was struck by an on-coming car that crossed the center line. The unrestrained seven-month old infant in his mother's lap in the right front seat of this car continued to move forward as did his unrestrained mother, who crushed him against the instrument panel, with fatal brain injuries the result.[4] The mother received multiple fractures.

2. A 1969 Pontiac was passed by another car and forced off the side of the road where it traveled along a ditch bottom striking first a tree stump, and then a tree. A fourteen-months old boy traveling in the right rear seat on the lap of an unrestrained 26-year old man was found face down with the adult on top of him, having received a fatal brain injury as well as multiple fractures and lacerations from contact with the back of the front seat and the adult. The adult holder sustained various injuries including a ruptured spleen and a leg fracture, but survived. In this same crash a nine year old passenger in the rear center seat, who was restrained by a lap belt, was not injured, showing that the overall forces on the vehicle were not only well below fatal magnitude, but also below those required to produce injury to a properly crash-packaged infant.[5]

3. A 1967 Volkswagen microbus proceeding through an intersection was struck broadside by a car that ran a red light. A 24 year old unrestrained woman in the right front seat of the Volkswagen, six months pregnant with twins, was holding a ten month old child on her lap. The woman was reported to have moved forward at initial impact, contacting the sun visor and the area of the vehicle above the windshield. She subsequently fell out on the roadway because the door design or its construction

did not keep it shut, with fatal injuries the result. A Caesarian was performed shortly before the woman died, but the twins subsequently died. The ten month old child contacted the instrument panel and sustained a depressed skull fracture. It was concluded that if the pregnant mother had worn a lap belt anchored across her pelvis there should have been no injury to the twins or to the mother; and that the ten month old would likely have received less severe injuries since the mother's body would not have further loaded the child's skull against the instrument panel.[6]

It is clear that parents must be made to realize the dangers of traveling with children on their laps. In doing so, they are exposing the children to the risk of unnecessary crash injuries, and creating situations in which they themselves are likely to inflict injuries to their children through bodily contact—no different in end result than if they batter their children deliberately. Pediatricians have important opportunities to warn parents against on-lap travel and should do so routinely. Both obstetricians and pediatricians should provide this information to their patients, as well as other information concerning the protection of infants and children in cars, that includes the following: (a) pregnant women should wear seat belts in cars to provide protection both to themselves and to their unborn children[7,8]; (b) infants and young children should always travel in appropriate restraint devices such as infant carriers and car seats, and the devices must be used properly so that they will serve their purpose of restraining them in crashes; (c) infants and children are least likely to be injured in crashes if they are both restrained and in the back seat;[9] and (d) all

vehicle occupants should be restrained in order to prevent or minimize the in-crash occupant contacts that pose a special threat to children. Routine performance of these simple practices by parents and others would prevent many of the approximately 1000 deaths, and thousands more injuries, sustained annually in the United States by motor vehicle passengers less than five years old.

There is evidence, however, that on-lap travel is difficult to eliminate through techniques of behavior change involving increased information, persuasion, or legislation. In a recent study in which three educational programs designed to encourage new mothers to use infant restraints to protect their babies were evaluated, the practice of on-lap travel was not reduced.[10] Educational programs in this study consisted of literature on restraints, personal discussions with health educators, easy accessibility and convenience in purchasing infant carriers, and—in one group—an offer of a free infant carrier. Results indicated that although the education increased use of infant restraints somewhat in comparison to a control group, little success was achieved in the primary goal of increasing use of restraints fastened by the car seat belt so that they provide crash protection. The most common mode of travel in each group was on laps, even though the dangers of this practice were specifically addressed in the literature provided and in the personal discussions. When infants were observed leaving the hospital, about 90% in each group were held in arms. When they were again observed at ages two-four months, the rate of on-lap travel was 47% among the 734 infants observed, slightly higher than the rate among infants in the 1974 observational survey (see Table 1).

Most countries that have passed seat belt legislation have unfortunately exempted children from restraint requirements. In the United States, Tennessee has enacted a law, effective January 1, 1978, that requires parents of children less than age four to transport them in approved and properly used child restraint systems.[11] Pediatricians and other physicians played a major role in gaining support for the legislation. However, this law contains an amendment exempting children from restraint use if they are held in the arms of older passengers. Thus the law could actually increase this dangerous practice and result in a net increase in injuries and deaths among children.

It is important to try to find effective ways to influence parents to provide their children with crash protection during car travel. However, crash protection for children can also be increased through "passive" strategies[12-16], that is, those that do not require the "active" cooperation of parents or others who transport them. These include techniques such as increasing the crash padding of vehicle interiors, and air bags, that work automatically when needed. Present generation air bags have been shown to be capable of providing substantial crash protection to unrestrained children as young as three years of age[17], and it is likely that they will provide some protection to even younger children, and children on laps. In the one known air bag crash involving on-lap travel, a three-year old child was traveling on his mother's lap in the front seat of an air bag equipped 1975 Oldsmobile. A lap belt was available but was not in use. The Oldsmobile collided head-on with another vehicle at combined closing speeds estimated at 40-50

miles per hour. Both mother and son contacted the air bag and were adequately restrained. The child received a scratch on his right thigh from his mother's bracelet but was otherwise unharmed, and it was concluded that the child would have had greater injury had there been no air bag.[18]

It should be noted that use of passive measures such as crash padding and air bags, and active measures that require individual cooperation, such as belts, are completely compatible. If both are in operation, greater protection is provided than by either alone. Therefore progress on one front should not preclude efforts on the other. Pediatricians and other physicians can play an important role in the support of both means of reducing the unnecessary crash injuries and deaths to children.

References


1. Williams, AF: Observed child restraint use in automobiles. Am J Dis Child 130:1317, 1976.
2. Huelke DF, Sherman HW, O'Day J: The hazard of the unrestrained occupant, in Proceedings of the 18th Conference of the American Association for Automotive Medicine. Lake Bluff, Ill., American Association for Automotive Medicine, 1974, pp. 1-14.
3. Collision Performance and Injury Report, Revision 3: Multidisciplinary Accident Investigation. Detroit, National Highway Traffic Safety Administration, January, 1976.
4. Multidisciplinary Accident Investigation Case #AA-165, Report #DOT HS 601 049, National Highway Traffic Safety Administration, Washington, D.C.
5. Multidisciplinary Accident Investigation Case #UM-251, National Highway Traffic Safety Administration, Washington, D.C.
6. Multidisciplinary Accident Investigation Case #UC-182, National Highway Traffic Safety Administration, Washington, D.C.
7. Crosby WM, Costiloe JP: Safety of lap-belt restraint for pregnant victims of automobile collisions. New Engl J Med 284:632, 1971.
8. Committee on Medical Aspects of Automotive Safety, Automobile Safety belts during pregnancy, JAMA 221:20, 1972.
9. Williams AF, Zador P: Injuries to children in automobiles in relation to seating location and restraint use. Accid Anal & Prev 9:69, 1977.

10. Reisinger KS, Williams AF: Evaluation of three educational programs designed to increase the crash protection of infants in cars, Pediatrics, in press.

11. Tennessee Code Annotated Section 59-930, as amended by House Bill 300, the Tennessee Child Passenger Protection Act of 1977, April 27, 1977.

12. Haddon W Jr: Research with respect to fatal accident causes: implications for vehicle design. Society of Automotive Engineers, Paper 366A, 1961. Reprinted in: Highway Vehicle Safety, Collected SAE Papers, 1961-1967, Society of Automotive Engineers, New York, 1968.

13. Haddon W Jr, Goddard JL: An analysis of highway safety strategies. In: Passenger Car Design and Highway Safety, Association for the Aid of Crippled Children and Consumers Union of the U.S., New York, 1962.

14. Haddon W Jr: Strategies in preventive medicine: passive vs. active approaches to reducing human wastage (Editorial) J Trauma 14:4, 1974.

15. Kelley AB: Passive vs. active = life vs. death. Society of Automotive Engineers, Publication No. 750391, New York, 1975.

16. Robertson LS, Heagarty MC: Medical Sociology: A General Systems Approach, Chicago, Nelson-Hall, 1975.

17. Abe F, Satoh S: Study on air bag systems for Nissan small-sized cars. Society of Automotive Engineers, Publication No. 740577, New York, 1974.

18. Multidisciplinary Accident Investigation Case #MI-ACRS-008, Report #DOT HS 602 666, National Highway Traffic Safety Administration, Washington, D.C.