

## Seat Belt Misuse and Belt-positioning Booster Seats

Latest Research on Belt-Positioning Booster  
Seats

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## Objectives

- Briefly review what is known about seat  
belt misuse among children transported in  
belt-positioning booster seats (BPBS)
- Describe the observational survey of  
children transported in car safety seats
- Report on the observed misuses of seat  
belts among children transported in BPBS
- Discuss implications for CPSTs, and  
advocates



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### Why is the correct use of seat belts important?

- Belt-positioning booster seats reduce the risk of serious injury and death by 59% (Durbin, 2003).
- Seat belts transfers the loading during a crash to stronger bony structures of the body.
- Incorrect fit of seat belts increase the risk of abdominal, spinal cord, and head injuries (Gotschall,1998; Winston, 2000; Kortchinsky, 2008).



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### Seat belts and booster seats previous studies

- Morris (2000): Child seat clinics—32% had at least one seat belt misuse (included shield boosters).
- Vesentini and Willems (2006) in Belgium noted 9%(high back) to 33% (backless) children with shoulder belt under their arm or behind back while transported in BPBS.
- Decina and Lococo (2005): Six state study noted improper fitting shoulder belt (20.9%) and lap belt (10.2%).



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### Reason for the Indiana Study

- 2005 Indiana enacted legislation requiring an appropriate child restraint system for children up to 8 years
- Booster seat use increased from 16% to 66%!
- *But were they being used correctly?*



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### Study objective

- Observe and report seat belt use and misuse among children transported in BPBS
- Identify factors that may influence the correct use of seat belts



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### Methods—design

- Cross-sectional, observational survey of children (age <16y) transported in motor vehicles
- Sites were 25 fast food restaurants and discount department stores throughout Indiana
- Study period—2006 and 2007.



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### Methods—survey

- Driver's survey reported:
  - the child's age, weight and gender
  - the driver's age, gender, race, income, education, and relationship to the child



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## Methods--observation

- CPST recorded vehicle seating location, restraint type, and use of the CRS harness or seat belt.
- Misuse criteria developed from established safety guidelines for use of BPBS and product instruction manuals (NHTSA, 2007; SafetyBelt Safe USA, 2007)
- Drivers who had misuses identified were given information on proper CRS use, a referral to CPST, or a new CRS.



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## Methods—data analysis

- The child's data was paired with their driver's data.
- Descriptive statistics were used to describe the characteristics of the drivers and children and the frequency of observed seat belt misuses.
- Multivariate logistic regression model was used to identify any significant independent variables for seat belt misuse.



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## Results

- Overall, 1,446 drivers participated and 2,287 children were observed
  - 570 children were observed in booster seats
    - Backless BPBS—346 (61.3%)
    - High back BPBS—218 (38.7%)
    - Six children transported in shield boosters were removed from this analysis.



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## Results—demographics

- “Average” driver:
  - the child’s mother
  - mean age of 35 years (SD =10.5 years)
  - white
  - at least a high school diploma,
  - annual family income of at least \$35,000
  - driver seat belt usage rate 90%
- “Average” child:
  - age of 5.1 years (SD 1.7 years)
  - males 53%
  - mean weight of 47 pounds.
  - Rear seat 96%




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## Results—overall misuse

- Overall, 64.8% of the children observed in belt-positioning booster seats had at least one seat belt misuse.

Observed misuses	Frequency	Percent
None	196	35.2
1	144	25.9
2	86	15.4
3	61	11.0
4	34	6.1
5+	36	6.4




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## Results—observed misuse

Observed seat belt use	% Misuse
Shoulder belt not mid-shoulder position	28.5
Lap belt not low on hips	13.7
Shoulder belt over seat armrest	35.8
Seat belt loose	24.5
Shoulder belt under arm	10.0
Shoulder belt behind back	9.1

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## Results—risk factors

Seat Belt Misuses	Reference Category	Odds Ratio	95% Confidence Interval
<b>One or more misuses</b>			
Driver age 15-24y	Driver age 25-64y	2.291	1.154-4.550
<b>Shoulder belt behind back</b>			
Race (nonwhite)	White	3.825	1.651-8.865
Child age <4y	Child age ≥ 4y	2.703	1.358-5.379
<b>Shoulder belt under arm</b>			
Child weight ≤ 40#	Child weight >41#	2.506	1.263-4.969
Education HS or less	Education >HS	2.626	1.407-4.900




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## What we learned....

- Large proportion of children transported in booster seats are using the seat belt incorrectly
  - Many of these misuses could lead to injury in a crash
  - Risk factors were younger drivers and smaller children
  - Many children were in booster seats when they would be better protected in a 5-point harness system




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## What we learned....

- Our results were comparable to other studies.
  - Association of age and weight to seat belt fit in our study is consistent with Morris et al.
    - Children weighing less than 40 lbs. (vs. >40#) were at least two-times more likely to have booster seat misuse.
  - Decina and Lococo reported that overall 39.5% of belt-positioning booster seats had at least one critical misuse.




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## What we learned....

- We differed from other studies
  - Site location
  - Finer definition of seat belt misuses
  - No shield booster seats
- Target groups for interventions
  - Lower socioeconomic groups
  - Younger drivers
  - Drivers with younger or smaller children



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## Limitations

- Volunteer sample of drivers at convenience sites
- Demographic differences



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## Conclusions

- A significant number of children are not using the seat belt correctly while being transported in a BPBS—Possibly increasing risk of injury.
- Children should be transported in a 5-point harness system until they reach the upper weight limit of the seat's harness.
- Drivers need to supervise the correct use of seat belts and prohibit improper placement of the shoulder belt behind the back or under the arm.
- Use local resources such as permanent fitting stations and CPSTs.



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