
 METHODOLOGIC ISSUES

Assessing child restraint misuse by parental survey

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Abstract

Objective—To determine the extent to which child restraint system (CRS) misuse can be evaluated by parental survey.

Methods—A cross sectional survey was conducted at eight CRS clinics from May to October, 1998. Before CRS inspection, parents were administered a structured interview to identify distinct characteristics of restraint use and misuse. After the interview, a certified child passenger safety technician team independently evaluated the restraint system and identified specific modes of misuse. Parent descriptions of CRS use were compared with observations of the technician and the degree of agreement between the two was assessed for several specific attributes of use.

Results—A total of 100 children restrained in convertible CRSs were included in the study. Parents were able to accurately report several aspects of child restraint use—in particular, the attachment and fit of the CRS, the use of the harness clip, and the CRS incline. Parents were less accurate in their characterization of the fit of the child in the CRS. For nearly every item assessed, parents were more accurate in their description of correct compared with incorrect use.

Conclusions—Interview tools can be developed that enable parents to describe aspects of CRS use and that screen for correct CRS use. These tools could be administered by telephone to obtain a more representative estimate of the prevalence of CRS misuse or to screen for CRS misuse. This screening would assist in targeting time consuming and costly CRS clinics to those parents who need them the most.

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Child restraint systems (CRSs) are extremely effective restraint devices. When used correctly, CRSs reduce the risk of fatal injury by 71% and hospitalization by 67%.¹ Increased CRS use is the principal reason that occupant fatality rates for children under 5 years of age have fallen 33% since 1977.² However, previ-

ous studies have demonstrated that CRSs are misused at an alarming rate. Estimates of the prevalence of CRS misuse range from 60% to 84%.³⁻⁷ Partial misuse of CRSs substantially reduces their effectiveness in preventing fatalities and serious injuries.¹

Current estimates of the prevalence of CRS misuse were obtained through self selected samples of parents voluntarily attending CRS clinics or through direct observation studies. These methods are time consuming and resource intensive and the generalizability of the results are limited by the nature of the study samples (that is, time of day, location of clinics and observation points, etc).

The development of a parent survey to assess CRS use characteristics might enable the evaluation of CRS misuse on a broader population. No prior study has determined the ability of parents to report their child restraint practices. Therefore, the objective of this study was to determine the extent to which CRS misuse can be evaluated by parental survey.

Methods

A cross sectional survey was conducted at eight child safety seat clinics sponsored by the Pennsylvania Department of Transportation and the SAFE KIDS Coalition of southeastern Pennsylvania from May to October 1998. The clinics were held at a variety of locations, including automobile dealerships, shopping centers, hospitals, and gatherings of parent groups. On arrival to the clinic, parents responded to a structured interview administered by study personnel. The interview was designed to assess the parent/driver's ability to describe the specific way in which their child was restrained in the vehicle and to identify distinct characteristics of restraint use and misuse.

After the interview, a team of two certified child passenger safety technicians, blinded to the results of the interview, conducted a comprehensive on-site assessment of the CRS in the parent/driver's vehicle while the child was restrained. The technicians assessed the installation of the CRS in the vehicle, the appropriateness of the child's age, height, and weight for the CRS, and the proper fit of the child in the CRS. A standardized CRS checklist, developed by the Pennsylvania Chapter of the American Academy of Pediatrics, was used to document specific characteristics of restraint use and modes of misuse. Two

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Table 1 Characteristics of the children, parents, and vehicles included in the study sample

Characteristic	Mean (SD)
Child age (months)	25 (11)
Child weight (kg)	13 (2)
Respondent age (years)	36 (9)
	No (%)
Respondent relationship to child	
Parent	92 (92)
Grandparent	8 (8)
Language spoken by respondent	
English	100 (100)
Vehicle type	
Four door sedan	28 (28)
Sport utility vehicle	24 (24)
Minivan	16 (16)

No=number.

technicians jointly evaluated each seat to establish whether or not a specific mode of misuse was present.

Up to 16 different modes of misuse were evaluated on each CRS. Because this study was performed as pilot work for a larger telephone survey regarding child passenger safety, only seven of the 16 misuse modes were chosen for evaluation of parent report. These seven items selected for evaluation in this study represent the seven that were present in the larger survey and those felt to be most amenable to parent report by telephone.

Descriptive statistics, including frequencies of categorical variables, and mean, standard deviation, median, and range for continuous variables, were calculated. Parent responses to the survey were compared with the technicians' observations and the degree of agreement between the two was determined for each misuse mode evaluated.

The technicians' assessment was therefore used as the "gold standard," and the sensitivity and specificity (with associated 95% confidence intervals) of the parent to detect/describe CRS misuse was calculated separately for each item assessed.⁸ The specificity of the survey reflects the proportion of time that the parent accurately described the selected item when the technician identified it as correctly used. The sensitivity of the survey reflects the proportion of time that the parent accurately described the selected item when the technician identified it as misused.

Results

A total of 100 convertible child safety seats were included in the current analysis. Infant

only (n=41) and booster seats (n=16) were not studied because limited numbers prevented meaningful analyses. No parent refused to answer the questionnaire. The average time per interview was approximately five minutes. Characteristics of the children, parents, and vehicles are shown in table 1.

Ninety three per cent of the CRSs demonstrated at least one form of misuse. The median number of misuse modes per CRS was 3 with a range of 0–7. The most common forms of misuse were not installing the seat tightly (80%), not using a locking clip when needed (73%), and not securing the child snugly in the seat (61%). A locking clip is a flat H shaped metal item intended to clip together the lap and shoulder belt of the vehicle seat belt near the buckle, to prevent the webbing from sliding through the latchplate.

Table 2 presents the results of the comparison between parent descriptions and the observations of the technicians for the modes of CRS use evaluated by the parental survey. The survey demonstrated very good specificity. For several aspects of specific CRS use, when the CRS was correctly used, parents were able to accurately describe the use. In particular, the survey demonstrated good specificity (>80%) for the attachment and fit of the CRS, the use of the harness clip, the description of the harness slot location, and the CRS orientation and incline. Snug fit of the harness was the only use characteristic in which parents were inaccurate in their description of proper use. Forty six per cent of those with correct fit of the harness (according to the technicians) actually described it as loose. For the other misuse modes, the percentage of parents incorrectly describing misuse when the CRS was used correctly was significantly smaller ($\leq 20\%$).

Parents were less accurate in their ability to detect and describe specific modes of CRS misuse. Some types of misuse (for example, failure to attach CRS with seat belt, improper CRS orientation) were rare, and, therefore, could not be quantitatively evaluated with regard to sensitivity. For nearly every item on which it could be determined, the sensitivity of the survey was lower than the specificity. Parents appeared to have particular trouble describing the fit of the child in the CRS, whether the fit was assessed as correct (that is, tight) or incorrect (that is, loose) by the technician.

Table 2 Accuracy of parental report for specific modes of child restraint system (CRS) misuse (n=100)

Item assessed	Correct use		Misuse	
	No of seats correctly used	Specificity* (95% confidence interval) (%)	No of seats incorrectly used	Sensitivity* (95% confidence interval) (%)
CRS attached by safety belt	97	100 (94 to 100)	1	Insufficient data
CRS orientation	97	98 (92 to 99)	1	Insufficient data
Harness clip use	86	96 (89 to 99)	6	Insufficient data
CRS incline	77	85 (74 to 92)	18	33 (14 to 59)
Harness slot location	64	82 (69 to 90)	31	74 (55 to 87)
Tight fit of CRS in vehicle	19	80 (69 to 88)	78	72 (46 to 89)
Snug fit of child in harness	24	54 (33 to 73)	37	64 (46 to 78)

*Specificity reflects the proportion of time that the parent accurately described the selected item when the technician identified it as correctly used. The sensitivity reflects the proportion of time that the parent accurately described the selected item when the technician identified it as misused.

Discussion

This study demonstrated that interview tools can be developed that enable parents to describe aspects of CRS use and that screen for correct CRS use. These tools could be administered during a telephone interview to obtain a more representative estimate of the prevalence of CRS misuse or to screen for CRS misuse. This screening would assist in targeting time consuming and costly CRS clinics to those parents who need them the most.

The overall prevalence of misuse, as well as the most common misuse modes, measured in this study was consistent with previous analyses.³⁻⁷ This study demonstrated that parents were able to accurately report several aspects of how their child was restrained in a convertible child safety seat. In particular, when properly used, parents accurately described the use of the safety belt to attach the CRS, the orientation and incline of the CRS, the use of the harness retainer clip, and the fit of the CRS in the vehicle. When misused, parents were less accurate in their detection and description of specific aspects of CRS use. Snug fit of the harness on the child could not be assessed accurately with the survey tool. Parents consistently over-estimated the snugness of the harness.

Currently, remediation of CRS misuse requires individualized technical assistance that takes into account the child, the CRS, and the vehicle. CRS clinics are one way to administer in-person education about correct CRS use and to directly observe CRS installation by parents. While this study employed an in-person interview, the results of this study can be used to develop a telephone screening survey to assess characteristics of actual restraint use. Telephone assistance on the correct use of CRS, in the form of CRS hotlines, has the potential to reach a broader audience with none of the seasonal or geographic limitations of clinics.

The National Highway Traffic Safety Administration (NHTSA) and others currently provide telephone technical assistance regarding proper installation of child safety seats. As awareness of the high prevalence of misuse increases, the demand for high quality telephone advice will increase. After the publicity associated with a report on CRS misuse in the popular press, the number of calls handled by the NHTSA hotline increases from 12 calls a day on average to as high as 200 calls per day (personal communication, Cheryl Neverman, NHTSA).

If a seat is described with an interview tool as used correctly, the need for an in-person evaluation at a CRS clinic is minimized. In contrast, if the interview tool revealed a misused seat, hands-on assistance would be more critical and the hotline operator could inform the parent of the next clinic scheduled in their area. The use of an interview tool as a screening process

would also maximize the time and effort invested in clinics by allowing the technicians to focus on those seats most in need of assistance.

One factor that must be addressed in development of a telephone interview screening tool is the liability of the interviewer. The tool must be robust enough so that the interviewer can be assured that they can recommend that no further in-person assessment is needed without concern that the parent simply did not adequately describe a misuse that might result in injury in a subsequent crash. In addition, any parent who remains concerned after the screen despite reassurance should be sent to a clinic. Further research must be performed to assess the ability of people to act on advice given over the telephone.

This study was conducted on a self selected sample of parents, voluntarily attending a child safety seat clinic, and thus, may not be representative of all parents using convertible safety seats. However, these motivated parents likely represent those that would contact a hotline for CRS assistance. In this study, all the respondents were English speakers and as a result, a similar evaluation must be performed for non-English speaking families. In addition, these results were obtained using an in-person interview and may vary when performed by telephone.

This study was performed as pilot work for a larger child passenger safety study that restricted the wording of questions in the parent interview. This constraint may have limited the parents' ability to provide more accurate responses to selected items. Several misuse modes evaluated by the technicians were not a focus of our pilot study and were not assessed in the parental survey. Future studies should explore the accuracy of parental identification of these additional use characteristics.

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