



National roadside survey of child restraint system use in Belgium



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ABSTRACT

In September 2011 the Belgian Road Safety Institute (BRSI) conducted its first roadside survey of child restraint system (CRS) use and misuse. The aim of this study was to obtain population-based estimates of the prevalence of use and misuse of CRS and to identify predictors of misuse on the basis of observations in real traffic conditions. The survey was conducted on randomly selected sites across the country, stratified across various types of journeys. The principal parameters analysed were: the characteristics of the children and the car drivers, type of journey, types of CRS and types of misuse. The sample consisted of 1461 children (under 135 cm) for whom the conditions of restraint were observed in detail and the driver was interviewed.

At least 50% of the children were not correctly restrained and 10% were not restrained at all. The most significant factors associated with CRS use were the use of a seatbelt by the driver (31% of unrestrained children for unbelted drivers, compared to 7% for belted drivers - only 32% of correctly restrained children for unbelted drivers compared to 54% for belted drivers), whether the CRS was bought in a specialized shop (only 27% of misuse compared to 45% of misuse for CRS both in supermarkets) and the age of the children. The proportion of correctly restrained children (appropriate without misuse, the bottom category in the figure) has a roughly curvilinear relation with age; decreasing from 75% at age 0 to 24% at age 8 and going back up to 63% at age 10. Although the sample of ISOFIX users was small ($n = 76$), it appears that the ISOFIX system reduced misuse significantly.

Most of the drivers were ignorant of their own errors concerning the inappropriateness and/or misuse of the CRS or they were remiss and underestimated the risk. The three main reasons given by the drivers to explain or justify the misuse noticed were: low attention level to safety (inattention, time pressure, and short distance), the child's resistance to be restrained, children restraining themselves and problems with the CRS. The present results suggest little or no change in the level of correct CRS use over the last five years and clearly reveal the unacceptably high levels of incorrect and/or inappropriate CRS use. This calls for campaigns and other actions to inform and motivate the population.

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1. Introduction

In 2010 nearly 1550 children aged between 0 and 10 years were involved in an injury accident as car passengers in Belgium. 4 of them were killed, 67 severely injured (Nuytens, 2012). In Belgium the use of seatbelts is compulsory for all vehicle occupants. Since 2006, the Belgian traffic law specifies that children under eighteen years of age that are smaller than 135 cm must travel in an adapted child restraint device. They can travel either in the front seat or in the rear if they are seated in an approved CRS conformed to the European standards ECE R44/03 or R44/04. There are exceptions to the main rule (Code de la route, 2012). According to the national road safety survey conducted by the Belgian Road Safety Institute

(BRSI) in 2009, 81% of the drivers declared that they always transported children safely while 7% confessed that they never or rarely restrained children in their car.

According to an observational study conducted in 2007 (Vesentini and Willems, 2007), more than half of the Belgian children were not appropriately restrained, according to their age, weight or height. Moreover, depending on the type of CRS used, 9–33 percent of the children were incorrectly restrained. Since this study was conducted very shortly after the introduction of the legal obligation to restrain children (in 2006), it is expected that the rate of inappropriate and/or incorrect use of child restraints would decline over time. It was therefore decided to conduct a new roadside survey of child restraint system (CRS) use and misuse. The aim of this study was to investigate the prevalence of use and misuse of CRS and to identify predictors of misuse on the basis of observations in real traffic conditions. This study was run in partnership with the European project CASPER. The study of Vesentini and Willems was

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only conducted in Flanders and focussed only on trips to primary schools and recreational areas. The aim of the present study was to obtain population-level estimates for the entire Belgian population and for a broader range of trips.

According to real-world crash data and recent field studies, the effectiveness of a CRS depends on the correct installation of the device in the vehicle, the correct securing of the child in the seat, and the use of an appropriate CRS. Several studies showed that incorrect and/or inappropriate fitment and use of restraints may reduce or nullify their safety benefits and are sources of a higher risk of fatal or severe injuries for children (Brown and Bilston, 2007; Kapoor et al., 2011; Lesire et al., 2007). Other studies have shown that CRS use depends on the type of CRS and the duration of the trip (Brown et al., 2006, 2010; CASPER Project, 2012; CEDRE Project, 2010; Decina and Lococo, 2005; Kahane, 1986; Lalande et al., 2003).

International observational studies reported that many children are not correctly restrained. This phenomenon seems to be widespread in North America, Europe and Australia. Snowdon et al. (2009) conducted roadside observations and observed that 90% of Canadian children were restrained in some type of restraint. However, only 60% of these children were restrained in the correct safety seat. Koppel et al. (2009) conducted roadside inspections and observed that 79% of all the restraints inspected had at least one type of misuse. The French project CEDRE (2010) and the European project CASPER (Lesire, 2012) conducted parking lot and roadside inspections and observed that 65% of children were incorrectly restrained.

According to Koppel et al. (2009) the most common forms of misuse are harness strap errors (38%), seat belt errors (32%), missing or incorrect fitting of buckle/locking clip (23%), the need for a missing sash guide (8%), tether errors (7%), and inappropriate use of a CRS for the size of the child (6%). The rate of misuse was highest for the forward-facing CRS (88%), compared to infant seats (67%) and booster seats or cushions (63%).

Observational surveys are the most common method used to assess child restraint use (Decina and Lococo, 2005; Snowdon et al., 2009, 2010; CEDRE Project, 2010; CASPER Project, 2012; NHTSA since 1994). There are two main methodologies for the data collection. For the first one, trained observers are posted at intersections (NHTSA, 2009a, 2010; Snowdon et al., 2010). The concern with this method is that child restraints and child characteristics are difficult to assess in a drive-by situation. The second method is a parking lot survey/inspection (NHTSA, 2009b; Snowdon et al., 2010). This second methodology allows investigators to assess the installation (child and device), to collect demographic characteristics (child and driver) and to provide data regarding use and misuse. According to a comparison of both methods conducted by Snowdon et al. (2010), the examination of in-depth issues regarding child safety seat use and misuse should preferably be based on parking lot surveys. Since the main aim of the present research was to estimate the appropriateness of CRS use, parking lot inspections were used in the present study.

2. Methodology

The survey consists of an assessment of the conditions of child restraint use by means of a detailed inspection by trained observers complemented with interviews with the drivers to collect demographic characteristics of drivers and children and other predictor variables. In order to reduce the data collection time, we did not measure children but investigators asked the drivers directly. The survey was based on the voluntary participation of the drivers transporting children.

In accordance with the Belgian traffic law, the study considers any person under the age of 18 and smaller than 135 cm as a child.

The targeted vehicles are those carrying at least one child likely to be transported in a suitable CRS.

2.1. Sampling design

A multi-stage clustered sampling method was used to collect the data. 80 observation sites were randomly selected from the entire Belgian territory, stratified by region (Brussels, Flanders and Wallonia). For each region (Flanders and Wallonia), a random sample of 20 municipalities was selected through proportional to size sampling (Statistics Belgium, 2010). In the Brussels region, the 40 draws were randomly done from the 19 municipalities without weighting. Each type of trip destination was randomly allocated to a time slot, resulting in the following scheme of observation sessions: 8 primary schools (weekday afternoon), 4 maternity hospitals (weekday morning), 3 shopping areas (Saturday afternoon), 3 recreational areas (Sunday afternoon) and 2 sport centres (Wednesday afternoon). Finally, these observation sessions were allocated randomly to each of the selected municipalities. Each site was visited once.

2.2. Variables

The questionnaire and the investigators' training sessions were designed in partnership with the CASPER project. Numerous parameters were collected in a standardized form for the analysis such as socio-demographical characteristics about children and drivers and predictor variables.

Socio-demographical variables about drivers and children: age, weight and height of the child. For the driver: age, education level, living place, link with transported children, type and age of the vehicle.

Predictor variables: travel duration and/or distance (data not statistically usable), restraint use of the driver, type of site, CRS purchasing place, number of children in the vehicle, seating position of the child, type of CRS (if restrained, cf Table 2 for the complete list), installation information (the person who installed the child, whether problems were experienced when installing the child).

Observed dependant variables: for each child restraint use or misuse was recorded as well as the appropriateness of this usage (CRS used appropriately according to the age, weight or height of the child).

A child is considered as unrestrained when no restraint system is used (just sitting on the seat, sitting on the lap of another passenger, standing ...), when the CRS in which it is installed is not attached to the vehicle or when the child is sitting in a CRS attached to the vehicle without the harness buckled.

Inappropriate use is manifest when children are not restrained accordingly to their height, age or weight. It could be a child restrained only by the seatbelt instead of using a CRS. Inappropriate use also includes the use of a CRS that is not corresponding to ECE R44. The Belgian legislation considers the use of a seatbelt to restrain children as appropriate (1) for children older than 3, (2) to the extent that the driver is not one of the parents, and (3) for exceptional trips on short-distance.

Misuse of a CRS means improper use of it considering the recommendations outlined in the instruction manual. The misuse detection requires an in-depth investigation and a good knowledge of CRS. It is possible to observe several types of misuse on the same device. Misuse can take different forms: incorrect fitting of the CRS in the vehicle (e.g. wrong routing of seatbelt), unauthorized seating position (e.g. forward facing for rearward facing device, active frontal airbag), incorrect restraining of the child in the restraint device (e.g. slack in harness system, seatbelt under the arm). A grid of the 6 major misuses per type of CRS was drawn up thanks to literature and CASPER project feedback, in order to facilitate the fieldwork of the observers. For each type of restraint

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