

RESEARCH METHODS FOR INVESTIGATION OF PREDICTORS ASSOCIATED WITH USING OF THE CHILD RESTRAINT SYSTEMS IN VEHICLE

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INTRODUCTION

Worldwide, traffic accidents present the 15th leading cause of death for children less than 4 years, and the second leading cause among children aged 5 to 15 years [33]. Traffic accidents are also the largest cause of death for children over 1 year in the territory of the US [6].

The most effective protection system for preventing child mortality in traffic accident is using of child restraint systems (seat belt, seats, booster and other) in vehicles [8].

Many researchers have been investigated different impact factors associated with child restraint systems. For children under one year, there are UN ECE R44.04 or R44.03 standards for safety seats. Beside that, there are many different standards in other countries like SAD and other.

Law obligation for using child restraint system is not the same in all countries. There are many different roles for using of the child seats in terms of child height and age. In this system, the most important, that using of child seats must be putted in the traffic law or other traffic acts.

In the literature review there are different methods for investigation of child restraint using level in vehicles. Some countries many years before have been investigated this segment and putted their methodologies on their web presentation. Besides that, there are also some other methodologies who investigated causes and consequences associated with child restraint systems in vehicles.

EFFECTS OF THE USING CHILD RESTRAINT SYSTEMS AND RISK LEVELS OF TRAFFIC ACCIDENTS

Using of child restraint systems is associated with traffic accident risk levels. Children who are not using protection systems and their parents can be involved by high risk level in traffic accident. This risks are associated with light and serious injuries and also with death.

However, there is important to respect all standards of protection systems by child age, because sometime using inappropriate protection system can be very dangerous in case of traffic accident. Because of that, researches have different attitude about risk levels for child's age.

Porter et al. [26] suggested that parents are the most responsible for child restraint systems using in vehicles.

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In the last 15th years many research studies have been evaluated the risk levels and child injuries associated with the vehicles involved in traffic accidents [10].

There are many sides who suggested that using appropriate child restraint can minimize the child injuries in traffic accidents [4], [3], [10],[28], [29], [30].

In the US investigation are made by a lot of databases from different sources and because of that is very difficult to compare data with other countries.

Problem also can be the premature graduation of child restraint system using according with child's age and height [24]. Also, using of appropriating protection system minimize the risk level for injuries in traffic accidents [22].

Child restraint systems in vehicles are designed to provide protection and to prevent or reduce the consequences resulting from a traffic accident [26].

Studies that have been researching the distribution use of the system of protection for children who were killed in traffic accidents, came to the conclusion that 73% of the total number killed children were not properly used protection systems in the United States, and 79% in Australia and New Zealand, and 64% in children under 1 year and 56% in children aged 1-4 years [26]. Because of that, the National Highway Traffic Safety Administration in US (NHTSA) recommends that all children under the age of 13 years must be on rear seats in vehicles [23].

Misconceptions among parents play the most important role in knowledge transfer for importance of child restraint systems [5]. It is therefore necessary to carry out continuous education of parents to ensure that children use the protection systems that is appropriate to their age.

The using of safety belts by drivers affect the using of child restraint systems in vehicles [13], [18], [2], [16], [14], [9].

Correlation between the drivers using safety belts and child protection system is stronger than the driver who is not using a seat belt and the child who does not use protection system [9].

The percentage of using the protection system have been significantly changed with the position of child in vehicle, and accordingly, the back seat is much better than the front seat in vehicle [14], [16].

The percentage of using the protections system decreases with children's age [7], an also depends on the location of research area and is higher in the recreational areas than in school zones.

Eby et al. [14] concluded that the level of use of the system of protection of children is higher in areas where all restraints used more and where drivers use seat belts, sports cars and commercial vehicles, as well as passengers in the front seat. They did not conclude that there are significant differences in the use of protection systems in the days of the week, sex of the child, and the types of locations in which data are collected.

For children over five years old, the research studies have been showed that there is no significant difference between using of the protection system according to the gender, time of day, and type of vehicle [14]. Higher levels using of the protection systems can be identified when: driver seat belt use; when the driver is female [26] when the vehicle is expensive; kindergarten compared to malls.

Based on the literature review, in Table 1. we summarized the effects of child protection systems to reducing risk level in traffic accidents.

Table 1 Review of research results of the child restraint systems using effects to minimizing the traffic accident risk consequences

Autori	Investigation results
<u>NHTSA [24]</u>	Using of child protection systems can minimize risk of death by 71% to the child's under one year and also minimize risk of death by 54% for the child's aged by 1-4. years old.
<u>Elliott et al. [15]</u>	There is 28% minimize risk of death in traffic accidents for children aged by 2-6 years who used all child restraint system in compare with children who used just safety belt for adults.
<u>Durbin et al. [12]</u>	Risk of injury in traffic accident can be reduced almost 60% for children (4-7 years) properly putted in the safety seats in compare with children who used just safety belt for adults.
<u>Lee, Schofer [20]</u>	Application of safety belts reduce injuries risks in traffic accidents to 45% at front seat, and 50% death injuries.
<u>Arbogast et al. [1]</u>	Properly used of safety seats for children aged over 4 years can reduced injuries in traffic accident by almost 70% in compare with using safety belt for adults.
<u>Durbin et al., [12]</u>	Children, age 4-7 years who use booster seats in compare with using safety belt for adults, have almost 50% better safety protection.
<u>Herz, 1996.</u>	Taking data from NHTSA Report for period from 1988. to 1994. year, investigator concluded that protection system for children (under 1 year old) reduce risk of death by 71% in car vehicles and 58% in vans. Also, the risk of death for children age 1-4 years old can be reduce by 54% in car vehicles and 59% in vans.
<u>Rice i Anderson [27]</u>	From NHTSA report for period 1996-2005. year, researchers concluded that using child protection systems reduce risk of death by 67% for children under 3 year and by 73% children under 1 year when compared to children who not used protection systems.
<u>Durbin et al. [11]</u>	Using of booster seats reduce risk of injuries by 59% for children age 4-7 years.
<u>Durbin et al. [10]</u> <u>Lennon et al., 2008</u>	For children under 13 years old, when they travel in the rear seat the injures accident risk is bigger for 40% [10] and two times bigger for children under 4 years old (Lennon, Siskind, Haworth, 2008).

SUMMARY OF METHODS FOR RESEARCH THE IMPACT FACTORS FOR USING THECHILD RESTRAINT SYSTEMSIN VEHICLES

The National Occupant Protection Use Survey (NOPUS) represents the only research on the use of child restraint systems in the vehicles, which being implemented on the entire territory of the United States. Research methodology involves a detailed selection of locations at which conducts research to obtain information in which nation the children are most protected with the child restraint systems in vehicles. All collected data are processed by the National Center for Statistics and Analysis in NHTSA. Statistical Reports are published annually.

Authors in [10] implemented their research methodology for collecting data on 66 locations in 31 district in seven states. They used locations like places of attractions with high volume of vehicles who have been transported children (shopping centers, medical facilities, parks with playgrounds for children, restaurants, fast food, etc.). In particular, taking into consideration the safety location, and when they can ease to collect data. Data were collected by two researchers, of which one was responsible for an interview with the drivers and the other is responsible for collecting the data on the use of child restraint systems in vehicles. Only data for vehicles with one child under 5 years aged were taken into account. The researches first asked the drivers if they want to participate in the study and about 5-10% of the total number of drivers did not want to participate. All researchers have completed special training by the NHTSA and they get a certificate. They are expected to well estimate which vehicles can participate in research and in conducting research to show the maximum degree of professionalism. All collected data were processed and analyzed according to defined procedures. For data analysis they used a descriptive statistics.

Vassentini, Willems [31] have investigated predictors who impacts on using child restraint system in the federal unit of Flanders in Belgium. Children aged under 12 years were a target group in this study. Data collection was taken from 30 recreation places (swimming pools, recreation centers, zoo etc.), and at the primary schools. The primary school taken 20 locations combined with kindergartens and the recreation areas taken at 10 locations. Based on the approval of the director of primary schools and managers of institutions, the researchers collected the data about safety belt using by driver, using child restraint system and they conducted a brief interview with the drivers/parents. During a interview, the researchers asked parents to provide them the information about child's age, the weight and height. Researchers taking into account only vehicles that were parked in recreational areas or school zones. During data collection, the children who were sitting on the lap of an adult parent are classified as the children who did not use protection systems. During investigation, researchers also analyzed the type of protection system which been used by children. Drivers also need to give information about travel destination. In order to define which of all variables significantly affected on using child restraint systems in vehicles they used the logistics regression analysis. During analysis they used personal variables like weight and height of children, and also used explanatory variables like travel time, using safety belt by driver, position in vehicle, type of restraint for children, number of children in vehicles and travel destination.

Eby et al.[14] also investigated some predictors in connection with using of child restraint systems for children aged 4-15. years in Michigan. To make some budget savings during the investigation they choose 28 areas and defined 128 locations for researchers. Locations were food restaurants, movie theaters, shopping malls, parks for recreation etc. All places are the generally categorized into the schools and others. All researchers took some education course during five days. After that, they have demonstrated the practical knowledge on some location. During investigation they collected information about older children in vehicle, the restraint system that they have been used, to recognized in which category children are selected, driver gender and gender of child in the vehicle. Investigation period was 30 minutes. If in on some location researcher could not work, he need to find the new researching location. Researchers need to include as many vehicles as possible. For children they recorded data about using restraint system, gender and location in vehicle, and vehicle type. Child who have been used safety belt for adults are compared with children who used child restraint systems. For data analysis they used descriptive statistics.

Porter et al. [26] have conducted investigation about using child restraint systems in Turkey. Investigation was conducted in period of 90-120 minutes on defined locations.

During investigation they observed children in car vehicles, vans and other vehicles. All children was categorized into 3 groups: up to 1 year, 1-4 years and 4-8 years. Researcher also documenting the data about driver gender and age, number of children in vehicle, children's age, type of vehicle and child restraint system types. The key dependent variables were the using safety belt by driver, child position in vehicle, and also does child seating in parents lap. All data was documenting in day traffic on 10 different roads in Turkey. For data analysis they used correlation method.

Brixey et al. [5] have investigated the effects of the introduction of new mandatory used of the child restraint systems in vehicles in the area of Milwaukee. Research was conducted in cooperation with health center and two non-government offices. They used data from reports who are made by parents. Key target of investigation was to determine using levels before, in grace period and after mandatory the fines. Researcher documented data about child's weight, height, gender, ethnicity, and the area in which he resides. Parents also had asked to give information about the type of child transport to the hospitality and type of restraint which had been used. Data set also included some information about child position in vehicles and does child had been involved into traffic accident in the last three months. Investigation focus was related to the children less than 8 years. All data were collected by the volunteers. Chi-square test was used for categorical variables, and the Multivariable logistic regression used to assess the using of the child restraint systems before and after implementation of traffic law. Taking that all data are simultaneously collected in the same location, we applied the method of regression analysis to generate the variables.

Williams et al. [32] are conducted the pilot program with the aim to improve the using of child restraint system in the area of Durham, North Carolina. They send some flyers to the children parents with the key messages about using child restraint systems in vehicles and penalties. Children in primary schools and health centers have attended the training program about importance of using child restraint systems in vehicles. After that, they conducted the evaluation process and concluded that using level of child restraint system is significantly bigger. Researchers in this study recommended that using level of restraint systems could be bigger if there is a lot of education programs and short-term actions. In this study they used a descriptive statistics.

Omari, Baron-Epel [25] in their study they tried to measure the rate child and adults using restraint systems in order to identify the associations between fatalistic beliefs and child restraint system use among Arab children. A random sample of 380 Arab drivers transporting children 8 years and younger in Israel were interviewed after observing 835 children traveling in 400 vehicles. Proper restraint ranged from 41% among children aged one to three to 9% among booster seat-eligible children. In a logistic regression model driver seat belt use, fatalistic beliefs, knowledge regarding the law on CRS, number of children in the car, age and gender were associated with all the children being restrained in the car. They concluded that drivers with higher levels of fatalistic beliefs had a lower odds ratio of restraining their children in the car, after adjusting for the other confounding variables (OR = 0.80, CI = 0.65, 0.97). They also mentioned that high levels of fatalism and low levels of knowledge in addition to other factors may inhibit Israeli Arab parents from restraining their children in cars. In this research they mentioned that children in communities are at risk of injury or death in motor vehicle crashes and there is a need for tailored interventions specific for this population.

Nambisan, Vasudevan [21] conducted a study with the aim to compare the using levels of restraint systems by children and adults in the two key situations in vehicles: First, when driver used the safety belt: Second, when driver do not used the safety belt. They conducted the research in the period of three years (2003-2005) in 50 cities at the area of

Nevada. Research sample was 20.000 driver during every year. Data collection was done by special researchers. Data was documented for location inside and outside of building areas and the special focus in posted on the driver gender and gender of passenger in the front seats. The null hypothesis in their study was: 'The level of using the seat belts in the passenger front seat is in the same regardless of the degree of use of seat belts by drivers'. An alternative hypothesis was: 'The percentage of passengers who used the seat belt in the front seats is higher when the driver was used the seat belt in relation to the average value of the use of seat belts for all passengers (without taking into account the degree of use of seat belts by the driver). Hypothesis testing was performed using the Z test.

Greenspan, et al. [17] in the framework of a researching study have conducted a assessment of the using level of the protection systems at the national level and to determined which children prematurely using safety belt for adults or riding in the front seat, in the study period of the 30 days. The survey was conducted by the National Center for injury prevention and control. Investigation period was by 23th July, 2001. to 7th February, 2003. year. The telephone survey was used for the investigation. Parents who have at least two children were questioned to give the answers. The parents were asked to give information about the type of restraint systems for children that they had used in the period before 30 days. In this investigation data collection was for children under 13 years. Average time, for every person was 20 minutes during investigation. Taking whole sample, 48% was approved to be a part of the investigation. Investigation results concluded that many of children in the front seats do used the child restraint systems by the law. Percentage of using child restraint systems has been higher when children are older.

CONCLUSION

In this work the presented research results and effects of using the child restraint systems in vehicles gives the obvious needs for taking some preventive and educational activities by key government institutions and others. During 2013. year in the Republic of Serbia was conducted research for documenting the most important traffic safety performance indicators of using child restraint systems in vehicles. Based on the results of that study, it was found that children used the protective systems at a very low level in the vehicles.

Future investigations in the Republic of Serbia need to give detailed information about key predictors who are in correlation with the use of child restraint systems in vehicles. There is need to investigate the reasons why using level is low and why children do not use the child restraint systems. After that, there is need to take some activities in cooperation with the key subjects in Republic of Serbia to take a higher level of children safety in vehicles.

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