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Svetlana Bačkalić, PhD¹

E-mail: basic@uns.ac.rs

Dragan Jovanović, PhD¹

E-mail: draganj@uns.ac.rs

Dragana Stanojević, PhD²

E-mail: dragana.stanojevic@pr.ac.rs

Miloš Pljakić, PhD³

E-mail: milos.pljakic@pr.ac.rs

¹ University of Novi Sad, Faculty of Technical Sciences, Department of Traffic Engineering
Novi Sad, Serbia

² University of Priština - Kosovska Mitrovica, Faculty of Philosophy, Department of
Psychology, Kosovska Mitrovica, Serbia

³ University of Priština - Kosovska Mitrovica, Faculty of Technical Sciences, Kosovska
Mitrovica, Serbia

CHILD PEDESTRIAN SAFETY EDUCATION: A CASE STUDY IN SERBIA

Key Words

Safety
School children
Pedestrian
Education

Abstract

The primary goal of the presented research are inception, implementation and evaluation of a pedestrian safety education program for school-age children (7 and 8 years old) without formal traffic safety knowledge and skills. The sample was taken among students from selected classes from four elementary schools located in various regions of the Republic of Serbia. In order to measure and evaluate the knowledge and behaviour, the students were put through testing before and after the pedestrian safety education program. Data were analysed using repeated multivariate analysis of variance test (MANOVA). The presented research provides evidence that education programs might be effective in improving pedestrian-related knowledge and behaviour among children.

1. INTRODUCTION

Walking or cycling to school or going to other activities for children has many benefits that affect the improvement of children's physical and mental health and socialization. Keeping children healthy, mobile and safe requires a balance between encouraging and allowing movement on the one hand and ensuring their safety in a complex traffic environment on the other. Young children have physical and cognitive limitations that make them more vulnerable in road traffic than others participants [1]. They lack experience and they are less visible to other road users due to their small stature. Children are also often unaware of the risks they take unintentionally, and more easily become innocent victims in collisions. Children under 12 years lack the perceptual judgement and skills to interact with a complex traffic environment. In the European Union in 2016, died 630 children in traffic accidents, half (48%) were vehicle occupants, 30% were pedestrians and 13% cyclists [2]. On the territory of the Republic of Serbia, in the past ten years (2010-2019), there were a total of 53 child pedestrian fatalities, up to 14 years of age, which is about 36% of total child fatalities [3].

Child road safety education is important at all levels from pre-school on for preparing children properly for traffic participation. The literature that considered the child pedestrian safety points out that there is a need to develop the skills and improve the behaviour of children in traffic condition [4-6]. The authors point out that crossing the road has been identified as a key child safety problem [7]. Therefore, it is necessary for decision makers to initiate programs to educate children about safe behaviour when they are walking, in order to develop the abilities and skills necessary for safer participation in traffic.

According to the school curriculum in Serbia, there are no individual subjects dedicated to traffic education. One of the key aspects of program implementation is the evaluation of its effectiveness. This evaluation is conducted by tests of knowledge and behaviour and real controlled conditions.

The training program lasted for three months. The children's behaviour test is designed in accordance with the guidelines of the most important literature dealing with the assessment of children's skills and behaviour of pedestrians in traffic [8-11] and in accordance with the program that is planned to be implemented by teachers with children in class. In order to measure and evaluate the knowledge and skills, the students were put through testing before and after the pedestrian safety education program.

The main goal of the presented research is evaluation of effects of implemented traffic safety education program on children's pedestrian knowledge and behaviour without formal traffic safety education.

2. METHODOLOGY

The sample was taken among students from selected classes from four elementary schools located in various regions of the Republic of Serbia. In order to measure and evaluate the knowledge and skills, the students were put through testing before and

after the safety education program. Data were analysed using repeated multivariate analysis of variance test (MANOVA).

2.1. Participants

The sample consisted of 217 students from second grade of elementary schools. Within this sample 97 (44.7%) children were from the control group, while 120 (55.3%) students were from intervention group. The sample consisted of 105 male students (48.4%), and 112 female students (51.6%).

2.2. Procedure

The training program lasted for three months. Theoretical training was done by trained teachers with their students in school classrooms, while the practice was done on specially prepared training grounds within school yards. All procedures performed in this study were in accordance with the ethical standards and all participants completed informed written consent. Evaluation of students' knowledge pre-training and post-training was done through a test at first session and final session. The knowledge test consisted of a series of 15 multiple choice questions. The duration of the test was 30 minutes. The test items referred to 5 learning models (where pedestrian can walk, how pedestrian can cross the street safely, risky situations, behaviour in car, behaviour near the bus stops).

The procedure for testing the behaviour of children as pedestrian is carried out in real but controlled traffic conditions, where the behaviour of children can be tested safely. The first condition, in terms of child safety, is provided by the presence of researchers at all places where children should cross the road. Each researcher is trained to evaluate child's behaviour in a valid and reliable way, using evaluation sheets. The children think that they are participating in a certain game. The game is called "Traffic Light". Between the starting and ending positions, there are researchers who record children's behaviour. At the beginning, children are given instructions on the path they should take, in such a way that it does not affect their behaviour. These behaviours are systematized into 11 activities.

3. RESULTS

Data analysis was performed using IBM's SPSS Statistical Package (Version 22). Descriptive statistics were used to examine the basic features of the sample. Furthermore, data were analysed using repeated multivariate analysis of variance test (MANOVA).

3.1. Analysis of child pedestrians' knowledge

Table 1 displays results of the two-way repeated multivariate analysis of variance (MANOVA) test for each cluster of knowledge individually and in total. Overall, there

was a statistically significant improvement in the level of knowledge before and after the implementation of the program in the control and intervention group. The children from the control group had a statistically significantly higher knowledge by 4.9% after the implementation of the program ($t = -3.02$; $p < 0.01$). In the intervention group, a statistically significant total increase in knowledge by 9.4% after the implementation of pedestrian education program ($t = -4.93$; $p < 0.01$). If individual behaviours are observed in the intervention group, an increase in behavioral levels can be observed in terms of identification places where pedestrians can walk by 12.8% ($t = -4.01$; $p < 0.01$) and road crossing ways by 23.9% ($t = -8.95$; $p < 0.01$).

Table 1. Changing the knowledge of child pedestrians before and after the implementation of the program

Knowledge	Group	Pre-intervention		Post-intervention		% change	t-value
		M	SD	M	SD		
Where pedestrian can walk	Control	57,0	22,6	68,1	23,2	11,1	-4,117
	Intervention	61,7	22,8	74,5	24,1	12,8	-4,013
How pedestrian crossing the street safety	Control	53,5	24,0	67,9	24,4	14,4	-4,103
	Intervention	59,4	23,5	83,3	20,2	23,9	-8,945
Risky situations	Control	74,7	30,7	61,7	33,8	-13,0	2,965
	Intervention	67,5	33,8	67,0	26,6	-0,5	0,134
Behaviour in car	Control	61,3	31,4	57,2	32,6	-4,1	0,897
	Intervention	61,6	32,1	64,5	31,0	2,8	-0,853
Behaviour near the bus stop	Control	82,1	27,7	82,7	26,4	0,6	-0,168
	Intervention	75,9	33,3	74,1	35,3	-1,9	0,435
Total	Control	65,3	16,9	70,3	15,8	4,9	-3,021
	Intervention	66,9	17,2	76,3	16,1	9,4	-4,933

3.2. Pedestrian behaviour analysis

Table 2 displays results of t-test with repeated measurements for eleven groups of observed behaviours of children pedestrians. Overall, a statistically significant difference was identified between students' behaviours before and after the implementation of the training by teachers. Behavioral improvement was achieved in both the control and intervention group. Students from intervention group showed a 48.1% more positive overall behaviour after the end of the three-month implementation period of education program ($t = -31.78$; $p < 0.01$). Regarding individual behaviours, a better result was achieved for each observed behaviour, and the difference for the intervention group ranged from 7.9% to 124.5%. In terms of

identification the place for walking, children pedestrians in the interventional group showed significantly more favorable behaviour by 7.9% ($t = -6.58$; $p < 0.01$). Furthermore, in terms of the way of moving on the sidewalk, the program influenced the improvement of behaviour by 34.4% ($t = -10.51$; $p < 0.01$). In situations of walking around obstacles on the sidewalk, children also achieved more favorable results by 37.0% after the implementation of the program in the intervention group ($t = -10.23$; $p < 0.01$). Furthermore, children from the intervention group after performing the education program had higher abilities to identify places for crossing the road by 38% ($t = -15.62$; $p < 0.01$).

Table 2. Changing the behaviour of child pedestrians before and after the implementation of the education program

Behaviour	Group	Pre-intervention		Post-intervention		% change	t-value
		M	SD	M	SD		
Identification the place for walking	Control	4,39	0,74	5,00	0,00	13,8	-7,287
	Intervention	4,63	0,56	5,00	0,00	7,9	-6,579
Moving on the sidewalk	Control	3,77	0,88	4,52	0,64	19,8	-7,403
	Intervention	3,53	1,05	4,74	0,5	34,4	-10,514
Walking around an obstacle on the sidewalk	Control	4,42	1,06	4,90	0,34	10,9	-4,337
	Intervention	3,58	1,31	4,91	0,29	37,0	-10,228
Identification of crossing points	Control	3,52	0,96	4,73	0,52	34,5	-10,633
	Intervention	3,54	0,83	4,89	0,40	38,0	-15,621
Stopping and waiting on the sidewalk	Control	3,13	0,77	4,38	0,72	40,1	-11,668
	Intervention	3,26	0,68	4,88	0,41	49,8	-21,606
Observation left – right -left	Control	2,65	0,73	3,91	0,74	47,8	-11,511
	Intervention	3,26	0,68	4,88	0,41	49,8	-22,675
Observation of traffic during the street crossing	Control	2,34	0,92	3,22	0,76	37,3	-6,782
	Intervention	2,21	0,83	4,42	0,59	99,5	-24,222
Road crossing speed	Control	3,27	0,98	4,15	0,74	27,1	-8,000
	Intervention	3,31	0,89	4,85	0,39	46,6	-16,127
Trajectory when crossing the street	Control	3,42	0,81	4,57	0,57	33,7	-10,812
	Intervention	3,49	0,82	4,94	0,28	41,5	-17,260
Respect of traffic light signals	Control	3,47	1,10	4,89	0,42	40,9	-11,867
	Intervention	3,56	1,02	4,95	0,33	39,0	-13,404
Crossing the access road	Control	2,22	1,22	3,94	1,12	77,7	-9,567
	Intervention	1,96	1,23	4,40	0,82	124,5	-15,746
Total	Control	3,32	0,49	4,38	0,29	31,8	-19,869
	Intervention	3,24	0,49	4,79	0,19	48,1	-31,784

4. DISCUSSION AND CONCLUSIONS

This retrospective research was demonstrated the impact of a safety educational course for elementary school-aged children without formal traffic safety education. Improvements were observed both in measured road safety knowledge and in observed behaviour change among children 7-8 years old.

This was in accordance with the previous studies [9,10,12] which concluded that education programs included in school curriculum resulted in improvement of knowledge on child safety.

Besides the results of the research show efficient of the implemented training program the study limitations should be highlighted. In addition to the fact that the number of students who participated in the research is satisfactory, a larger number of students should be included in future research.

Future efforts should be directed towards promotion and implementation of safety education programs in schools where there is no formal traffic safety training.

REFERENCES

- [1] DaCoTA, "Children in road traffic: Deliverable 4.8c of the EC FP7", project DaCoTA,2012.<http://www.dacotaproject.eu/Deliverables/Webtexts/Child%20Traffic%20Safety.pdf>.
- [2] ETSC, "Reducing child deaths on European roads. Pin Flesh Report 34", European Transport Safety Council, Brussels, 2018.
- [3] RTSA, "Statistical report on the state of road safety in the Republic of Serbia for the year 2019", Road Traffic Safety Agency, Serbia, 2020.
- [4] J. Percer, "Child pedestrian safety education: Applying learning and developmental theories to develop safe street-crossing behaviors", (No. DOT HS 811 190). United States, National Highway Traffic Safety Administration, 2009.
- [5] C. M. McLaughlin, W. E. Barry, E. N. Barin, M. Mert, C. Lowery, J. S. Upperman,, and H. Arbogast, "Interactive education is associated with lower incidence of pedestrian-related injury in children", *Journal of surgical research*, 244, 57-62, 2019.
- [6] DOT, "Pedestrian Safety Lesson Plans: Kindergarten through 3rd grade", Department of Transportation, Colorado, 2009.
- [7] D. Cross, M. Stevenson, M. Hall, S. Burns, D. Laughlin, J. Officer and P. Howat, "Child pedestrian injury prevention project: student results", *Preventive medicine*, 30(3), 179-187, 2000.
- [8] W. H. Yeaton and J. S. Bailey, "Teaching pedestrian safety skills to young children: An analysis and one-year followup", *Journal of applied behavior analysis*, 11(3), 315-329, 1978.

- [9] D. Cross, M.Hall and P. Howat, "Using theory to guide practice in children's pedestrian safety education", *American Journal of Health Education*, 34(sup5), S-42, 2003.
- [10] G. A. Hotz, S. M. Cohn, J. Nelson, D. Mishkin, A. Castelblanco, "Pediatric pedestrian trauma study: a pilot project", *Traffic injury prevention*, 5(2), 132-136, 2004.
- [11] M. C. Kenny and S. K. Wurtele, "Teaching preschoolers safety rules: a pilot study of injury prevention", *Children's Health Care*, 45(4), 428-440, 2016.
- [12] G. A. Hotz, S. M. Cohn, A. Castelblanco, S.Colston, M. Thomas, A. Weiss and R. Duncan, "WalkSafe: a school-based pedestrian safety intervention program", *Traffic injury prevention*, 5(4), 382-389, 2004.