




УНИВЕРЗИТЕТ У НИШУ  
UNIVERSITY OF NIŠ

ФАКУЛТЕТ ЗАШТИТЕ НА РАДУ У НИШУ  
FACULTY OF OCCUPATIONAL SAFETY



IN PARTNERSHIP WITH: **U PORTO**  
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UNDER AUSPICES OF:  MINISTRY OF EDUCATION, SCIENCE  
AND TECHNOLOGICAL DEVELOPMENT  
OF REPUBLIC OF SERBIA



# 50 Years

of Higher Education  
Science and Research in  
Occupational Safety Engineering

# PROCEEDINGS

The 18th Conference of the series  
Man and Working Environment  
INTERNATIONAL CONFERENCE  
50 YEARS OF HIGHER EDUCATION, SCIENCE AND  
RESEARCH IN OCCUPATIONAL SAFETY ENGINEERING



NIŠ, 6 - 7 DECEMBER 2018.



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## Welcome Message from the Organizing Committee Chair

Dear Colleagues,



On behalf of the CIRS Organizing Committee, it is my great pleasure to welcome you to the International Conference *50 YEARS OF HIGHER EDUCATION, SCIENCE AND RESEARCH IN OCCUPATIONAL SAFETY ENGINEERING*.

Since 1982, the Conference Man and Working Environment has made an extraordinary success, being held with different main themes. By promoting scientific research, continuous education and industrial applications, it has been established as the leading conference in the field of safety in this region.

The Conference host, Faculty of Occupational Safety in Nis, has recently celebrated fifty years of its existence as a higher education institution. Owing to the enthusiasm and efforts of all the Faculty staff from 1968 until today, the Faculty has developed as an integral part of the great academic community, following all societal changes and its needs, especially in the field of environmental protection and occupational safety.

This year, the Conference will bring together the delegates from 10 countries who will share with us their latest results, international expertise and experiences. As in previous conferences, poster and oral presentation sessions will provide all participants with the opportunity to discuss their results with other experts in the field.

The themes of the 18<sup>th</sup> Conference of the series Man and Working Environment cover a broad set of issues in the field of safety:

- technologies and technical systems of safety
- physical and chemical aspects of occupational and environmental safety
- social and health aspects of occupational and environmental safety
- risk assessment and management

I would like to thank all those who contributed to this Conference, especially the authors and the participants who, due to their presence, have made it a success. Also, I thank the Programme Chairs for their suggestions and reviews. Last but not the least, this Conference would not be possible without support from the Ministry of Education, Science and Technological Development of the Republic of Serbia and other sponsors.

Sincerely,

Chairman of the Organizing Committee

  
Prof. Ivan Krstić, Ph.D.

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## NEW PEDAGOGICAL APPROACHES IN DIGITAL MEDIA - ENHANCED TRAFFIC SAFETY TRAINING FOR CHILDREN

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**Abstract:** According to World Health Organization (WHO) estimates, 186,300 children die annually from road traffic crashes globally, equivalent to over 500 child deaths daily. Road traffic injuries are among the top four global causes of death in children between the ages of 5 and 14 years. Among these deaths, children as pedestrians accounted for about 38%. To create effective intervention programs, the research on pedestrian safety risks associated with age is needed. For these reasons, an experiment was conducted to explore the impact of using tablet PC devices for learning purposes in the field of traffic safety. The results indicate that children show better performances when working with tablet PC, than in simulated traffic situations. Thus, it is important to take these findings into account when aiming to train children for road safety.

**Key words:** Traffic safety, Tablet PC, training, children.

### INTRODUCTION

Modern traffic imposes complex and high requirements on all participants, particularly children. The lack of maturity of children and their modest life and traffic experience, as opposed to the exposure and risks propensity and challenges, leads children to be one of the most vulnerable categories of traffic participants. Given that traffic is one of the most important and the most difficult experiences in life for every child, it is not easy for them to adapt to an environment which is permanently in motion.

Children constitute an important class of the road users, and despite the fact that they are not allowed to drive motorized vehicles (except bicycles) themselves and therefore seldom hurt other road users, their ability to anticipate hazards can protect them from being hit by others, such as when crossing the road (Meyer et al., 2014). Their ability to perceive unsafe situations can also reduce the likelihood that they will be injured or killed in accidents. Previous studies have aimed to understand and identify factors of child pedestrian risk. For instance, in relation to the most common road traffic accident situation among children, unsafe street crossing, studies show that advanced perceptual and cognitive skills are needed (Schwebel, et al., 2012). Research has recognized that young children have lower hazard perception skills than adults (Meyer et al., 2014) and are more prone to impulsive actions in traffic (Briem and Bengtsson, 2000). Children have difficulties assessing a car's approaching speed and therefore interpret distance between themselves and a car as greater than it actually is (Connelly, 1998). Further, even if children may choose the same gap size for crossing the street, their risk of accident involvement is

increased as they delay the start of the crossing, thereby reducing the available time to cross the street safely (Pitcairn and Edlmann, 2000). Some studies find that tablet PCs are convenient for traffic safety education of children (Trifunović et al., 2018; Čičević et al., 2017).

Tablets have been shown their potential to be used in education of children since their commercial exploitation from 2010. However, there are some drawbacks in their usage. Some educators are enthusiastic regarding tablets' use in education as a new medium (Galloway 2008), whereas others claim tablets are not appropriate for children (House 2012).

Some findings suggest that tablet design is suitable for children. Because tablets are user-friendly children become enthusiastic and competent quickly (Lynch and Redpath, 2014). Several technologies (mobile, multimedia...) are combined in a tablet device, and they form so-called "digital playground" for children. Empirical arguments lead to the conclusion that the kinaesthetic characteristics of the tablet and their ability to be used for learning through gaming lead to a positive approach in education (Papadakis, 2016).

This research illustrates the benefit of conducting traffic safety studies and testing of children using tablet PCs, and also discusses both methodological challenges and their potential solutions.

### METHODOLOGY

#### Participants and Experimental Procedure

The research sample consisted of 98 children. Of the total number of the respondents, 49 (50%) were females and 49 males. The sample is comprised of several groups: children attending primary school, from



the first (aged from 6.5 to 7.5 years), second (aged from 7.5 to 8.5 years), third grade (ages from 8.5 to 9.5 years) and fourth grade (ages from 9.5 to 10.5 years).

In the experiment a test was presented to children, designed to examine their behaviour in simulated traffic situations and with Tablet PC.

Traffic situations presented to children were:

- Pedestrian behaviour at crosswalks with traffic light (red and green light);
- Behaviour at the traffic light for cyclists (red and green light);
- Crossing the street on a pedestrian crossing;
- Crossing the street outside a pedestrian crossing.

Identical traffic situations are presented on Tablet PC and in simulated traffic environment. All subjects were tested for two different conditions and all traffic situations.

### DATA ANALYSES

The answers were recorded in paper form. These data are loaded and processed in a database made in MS Excel. Statistical analysis was performed by the statistical software package IBM SPSS Statistics v. 22. The basic statistical analysis of data included descriptive statistics and cross tabulation. Normality distribution was tested by inspection of histograms and the Kolmogorov-Smirnov test. As the Kolmogorov-Smirnov test has determined that results do not significantly deviate from a normal distribution, the decision was to use Student's T-test and ANOVA. Bonferroni Post Hoc test has been used for additional comparisons (Trifunović et al., 2017, Trifunović et al., 2018). All tests were carried out on the basis of the recommendations of the textbook "SPSS Survival Manual" (Pallant, 2013). The threshold of statistical significance ( $\alpha$ ) is set at 5%.

### RESULTS AND DISCUSSION

In this experiment, it was shown that all respondents were able to recognize the traffic concepts of sidewalk, roadway, bicycle path, pedestrian and bicycle traffic light.

Further, children behaviour in different traffic situations presented on tablet PC and in simulated environment were compared.

Children knowledge on behaviour required in traffic situations and the meaning of elements of traffic signalization is presented in Figure 1. Children show 100% correct responses for the situation when crossing the street is prohibited (red light is on) for pedestrian and bicyclists, while the lowest percentage of correct answers when traffic light indicate that crossing the street is permitted (when the green light is on).

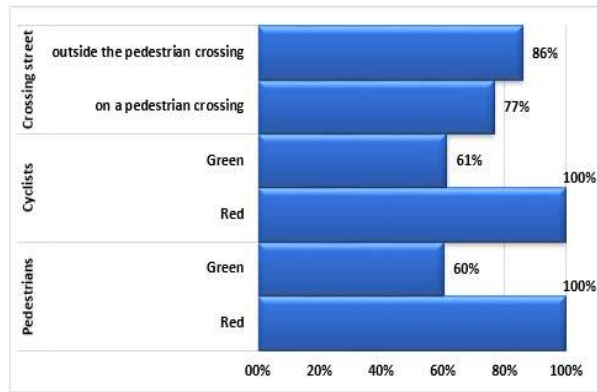


Figure 1. The mean percentage of correct answers for different traffic situations

### Age differences

The results of One-way ANOVA showed statistically significant differences in interpreting the green light for pedestrians on a traffic signal among the children in different grades ( $F=6.979$ ;  $p<0.001$ ) children.

There are also statistically significant differences for green traffic lights for cyclists with respect to participants age ( $F=5.916$ ;  $p<0.001$ ).

In other words, there are significant differences in children answers, i.e., the knowledge upon traffic situations for the first in comparison to the third and fourth grade, as well for the second in comparison to the third and fourth grade.

Figure 2 shows descriptive statistics on children's accuracy, by age group, for particular behaviour in different traffic situations.

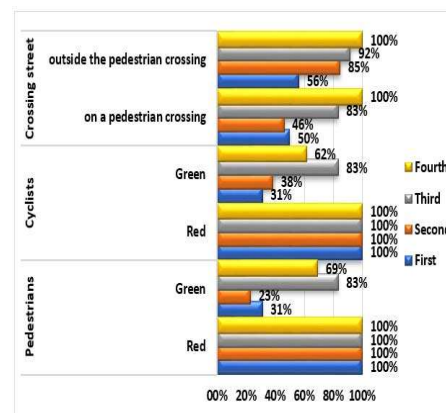


Figure 2. Age differences in percentage of accurate responses for different traffic situations

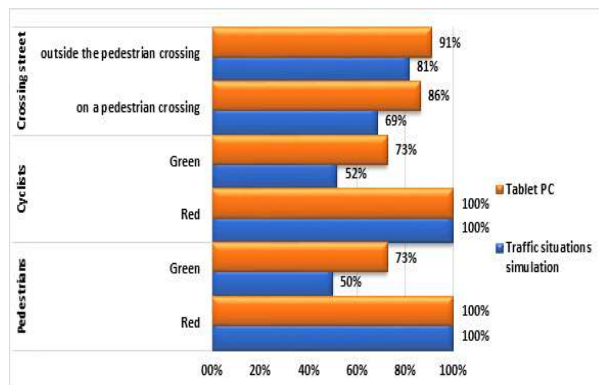
The results showed statistically significant differences for crossing the street on a pedestrian crossing for the first in comparison to the third and fourth grade ( $F=7.928$ ;  $p<0.001$ ), as well for the second in comparison to the third and fourth grade, for crossing the street outside of pedestrian crossing ( $F=7.229$ ;  $p<0.001$ ). On the basis of the data shown above we can conclude that older children show better knowledge

and understanding of traffic rules in different traffic situations.

### Simulated traffic situations vs. Tablet PC

Children answers to same traffic situations presented on Tablet PC and in simulated traffic environment are presented in Figure 3.

The results of Student's T-Test showed statistically significant differences in performances between the two conditions (simulate traffic situations vs. tablet PC) for: green traffic lights for pedestrians ( $t = -2.326$ ;  $p < 0.001$ ), green traffic lights for cyclists ( $t = -2.137$ ;  $p < 0.001$ ), crossing the street on a pedestrian crossing ( $t = -2.099$ ;  $p < 0.001$ ) and crossing the street outside of pedestrian crossing ( $t = -1.325$ ;  $p = 0.007$ ). Children show better performances when the same traffic situation was presented on tablet PC, than in simulated traffic environment.



**Figure 3.** Children performances in simulated traffic environment vs. Tablet PC condition

### CONCLUSIONS

Based on the data collected and analyzed in our research, it can be derived several conclusions:

- Children show better knowledge upon the situation when crossing the street is prohibited either for pedestrians or for cyclists, while the percentage of correct answers is decreasing in the situation when crossing the street is allowed;
- Knowledge and understanding of traffic rules in different traffic situations increase with age;
- Children show better performances when the same traffic situation was presented on tablet PC, than in simulated traffic environment.

Using of tablet PC has shown advantages over simulated traffic environment as a means for various traffic related contents presentation, most probably due to children immaturity and lack of experience in real traffic situations. A better understanding of how children respond to the different experimental environment (traffic situation simulation vs. tablet PC presentation) can be used for the improvements of children training process for traffic safety. Thus, tablet PCs could become a popular instruction tool that can improve children' learning, and hence their performances. However, future research should

continue to investigate children behaviour in a larger number of different traffic situations, as well as to cover different age groups of respondents. Using the tablet computer requires further research to fully understand the potential of application of new information and communication technologies in the educational process and evaluation of children's performances, as well in conforming to individual differences. These facts and the results should be used in practical terms that enable children to learn in the ways they prefer, using modern technologies. In this way, the area of road safety will be closer, more accessible and more interesting to children, that should use it to acquire new knowledge, develop appropriate attitudes and proper behaviour in traffic, which will finally result in increasing the level of overall security of the youngest participants in traffic. In addition, the knowledge, attitudes and behaviour acquired in early childhood provide important foundations which will facilitate the knowledge to be acquired in the future, in educational settings for driver training and assessment (Trifunović et al., 2018; Čičević et al., 2017).

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## NOVI PEDAGOŠKI PRISTUPI - PRIMENA DIGITALNIH MEDIJA U OBUCI DECE O BEZBEDNOSTI U SAOBRAĆAJU

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**Rezime** Prema procenama Svetske zdravstvene organizacije (WHO), na svetu 186.300 dece godišnje strada u saobraćajnim nezgodama, što predstavlja više od 500 nastradale dece na dan. Saobraćajne nezgode spadaju u jedan od četiri vodeća globalna uzroka smrtni dece između 5 i 14 godina starosti. Od navedenog broja, 38% dece stradaju kao pešaci u saobraćaju. Da bi se unapredila bezbednost dece u saobraćaju, pored edukacije, neophodno je i konstantno istraživanje rizika stradanja dece u saobraćaju. Navedeni razlozi su inicirali sprovođenje eksperimentalnog istraživanja, koje ima za cilj da ispita primenu digitalnih medija i multimedijalnih sadržaja u edukaciji dece o bezbednosti saobraćaja. U eksperimentu je učestvovalo 98 ispitanika. Reultati su pokazali da deca imaju veći procenat tačnih odgovora na tablet računaru, kada im se zada da rešavaju zadatke vezane za ponašanje u saobraćaju, za razliku od istih takvih saobraćajnih situacijama koje im se zadaju u simuliranim saobraćajnim uslovima. Navedeni rezultati ukazuju na prednost upotrebe tableta u procesu obuke dece o bezbednim načinima ponašanja u saobraćaju kao i značaj edukacije za povećanje nivoa opšte bezbednosti ove populacije u saobraćaju.

**Ključne reči:** bezbednost saobraćaja, tablet računari, obuka, deca.