

## Safety4Bikes: (Usability-)Evaluation of an Assistance System for Cycling Children

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### Background

Children are vulnerable road users in the sense one of being unexperienced traffic participants. In the research project “Safety4Bikes” we developed and implemented a multi modal approach to improve the safety of children as cyclists on the road. By determining the age where children are most likely to be involved in an accident while riding a bike as well as the corresponding most dangerous situations for child cyclists our research project focused on children between 7 and 14 years.

### Aim

The project aims to assist children in those situations in three manners: 1.) A helmet was enhanced to send signals and alerts to the cyclist. 2.) By attaching a breaking assistant and sensors to the bicycle to sense the surrounding and allow cyclists to perceive dangerous situations. 3.) An application that proposes a safe(r) cycling-route for children beforehand and gives regarding hints and explanations in a follow-up to the ride. The aim of the presented evaluation study was to clarify the suitability and acceptance for the intended user group within a qualitative study by applying the technology in realistic scenarios.

### Method

The three approaches have been evaluated with 14 children aged 6 – 12 in a qualitative study. Our evaluation was structured in two parts. Before the bicycle-ride children were testing the smartphone-application, which was evaluated via the “thinking-aloud-method” and a post-task questionnaire (ASQ). Then children wore the helmet and rode two rounds on a driver-training course. First, the children were guided through the course using navigation signals on the helmet. During a second round we simulated dangerous situations and engaged the breaking assistant three times in three notification-levels. The children have been asked a few questions during the ride and in a follow-up.

### Results obtained

The results show that all children liked the equipped bicycle and thought of the breaking assistant as a good idea. They understood the light signals of the bike and they intuitively understood the warning signals. For the children, a gamification factor (collecting points during the bicycle ride) was very important. The younger children of our target group did not understand the application intuitively. Moreover, the youngest ones had problems reading the texts. In addition to previous studies the results for navigation cues and warning hints showed the necessity of unique and clearly visible signals.

### Conclusion

In addition to previous results the evaluation confirmed the benefits of applied technical improvements and remaining usability-problems among the assistance system. The results indicate potential further enhancements of the navigation-application also to address younger cyclist. Furthermore, the adjustment of the strength and engagement time of the breaking assistant is foreseen.