The impact of supportive and procedural information on hazard perception learning

Roland Bruenken - Saarland University
Jana Hilz - Saarland University
Sarah Malone - Saarland University

Poor hazard perception skills contribute to the high crash involvement of novice drivers. Obviously, the short period of driving instruction is not enough to run the whole range of possible hazards and practice to avoid them. However, hazard perception can also be taught by computer-based trainings (CBTs; e.g. Petzold et al., 2013). Hence, well-designed CBTs can complement driver training. Based on Cognitive Load Theory, the Four-Component Instructional Design (4C/ID) Model (van Merriënboer & Kirschner, 2007) was developed for complex skills acquisition and might therefore be suitable for designing an adaptive learning environment to teach hazard perception skills. We applied the 4C/ID model to the hazard perception domain and investigated the effectiveness of several of its components. As learning tasks animated traffic scenarios were presented (Malone & Brünken, 2016). To support learning, two types of learning information were realized: supportive and procedural information. In line with the 4C/ID model this information was presented consecutively to minimize cognitive load and perceived task difficulty.

Ninety-one adolescents participated in a study using a 2 x 2 design with the between-subjects factors supportive information (with vs. without textual explanations about what constitutes hazards) and procedural information (with vs. without highlighting of hazard cues in animations and corresponding audio prompts). In subsequent test scenarios the trainees were instructed to identify emerging hazards. Reaction times (RTs) and number of identified hazards (accuracy) were recorded as dependent variables as well as invested mental effort and task difficulty measured by self-rating scales (Korbach, Brünken & Park, 2017).

Conducting an ANOVA for the dependent variable RTs we found a sig. main effect for supportive information ($F_{1,87} = 9.82$; $p = .002$; ?p2 = .10), indicating that the more extensive information participants got the faster they responded to upcoming hazards. However, an ANOVA for accuracy revealed a main effect for procedural information ($F_{1,87} = 5.53$; $p = .021$; ?2 = .06). Providing evidence that, if supplied with procedural information, the participants were more likely to identify hazard cues. Thereby, the perceived amount of mental effort ($F_{3,87} = 1.71$; $p > .05$) and subjective task difficulty ($F_{3,87} = .24$; $p > .05$) did not differ across the four conditions. Meaning, that the presentation of both information types is not resulting in higher cognitive load (or higher perceived task difficulty) than offering only one type of information. Thus, the results encourage the application of the 4C/ID model in hazard perception training, because supportive and procedural information fostered learning regarding distinct aspects of performance, without increasing cognitive load and difficulty.