The development of a cognitive skills training to support driver education

Comparing performance of experienced and trained learner drivers

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Introduction

- crash numbers of novice drivers are alarmingly high (e.g. OECD, 2006)
- one central explanation: deficits in cognitive skills such as hazard perception (e.g. Finn & Bragg, 1986)
- conventiontal forms of driver training have largely failed to build up those skills
- examples show the potential of computer based trainings (CBTs) in this regard (e.g. Fisher et al., 2002)
- however, effects of available CBTs have mostly been found when compared to untrained control groups, whereas it is unclear how this “improved” behaviour relates to the behaviour of experienced drivers
- by testing a group of experienced drivers on the same scenarios that we used in a previous experiment in which we assessed the effects of a CBT (Petzoldt et al., 2013), we tried to create a benchmark against which to compare the learner driver performance from our earlier study

Method

- three groups of drivers:
  - (learner driver) CBT group and (learner driver) control group (data from previous study)
  - young "experienced" driver group (average driving experience of ca. 65,500 km)

Fig. 2: TUC Driving Simulator

- CBT training for CBT group, irrelevant task for control group, no task for experienced group
- simulator test (Fig. 2), situations (nine analysed) constructed to reflect content of the CBT to a varying degree
- 36 usable data sets (because of eye tracking issues)
- coding of glance sequences, first completion of critical glance sequence (from hazard indicator to relevant area) as central dependent measure
- coding of driver behaviour in analysed situations as either optimal, suboptimal or inappropriate

Computer Based Training

three parts

(1) a pre-test on theoretical knowledge,

(2) an instructional phase, and

(3) the actual training

actual training

- short clips of traffic scenes, embedded in a Flash environment
- display of potentially hazardous situations
- two different sessions, 13 video clips each, approx. 45min to complete one session
- clips:
  - 50-70sec in length
  - 2-4 items/questions per clip (clips are stopped and resumed after response)
  - broadly classified in two categories – (1) hazard indicators in vertically distant positions ("far ahead") and (2) hazard indicators in horizontal positions ("left & right")
- multiple choice format for most items (see Fig. 1)
- correct response only possible with understanding of the dynamic development of the situation, not by searching the frozen image

Fig. 1: Example for multiple choice item

(the item reads: "Which of the following statements is/are true?" - a) the lead vehicle might brake; b) I cannot safely pass; c) pedestrians might cross the street; d) the bus is about to leave the stop)

Results & Conclusions

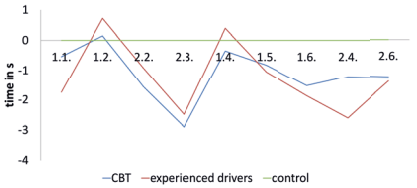

Fig. 3: Difference in time until completion of relevant glance sequence compared to control group, separate for each situation (numbers on x-axis indicate situation)

- CBT group learner drivers showed performance similar to experienced drivers in the glance measure, both performed better than control group (Fig. 3)
- differences in rated handling of three of the test situations (ceiling effects in the other situations) - experienced drivers outperformed both learner driver groups (Fig. 4)

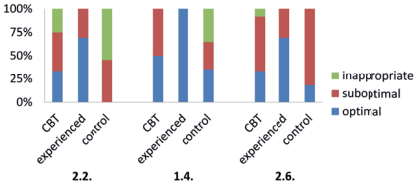

Fig. 4: Performance as rated by experts for three of the critical situations

- it seems that glance behaviour can be learned with the help of a CBT to a substantial degree
- however, appropriate behavioural patterns that require quick decisions and motor responses require a higher level of automatisation, and appear to be beyond the capabilities of a simple CBT that does not employ a more realistic interaction format

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