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Can computer based trainings improve driver education?

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cieca The International Commission for Driver Testing

TÜV SÜD

Collaborators

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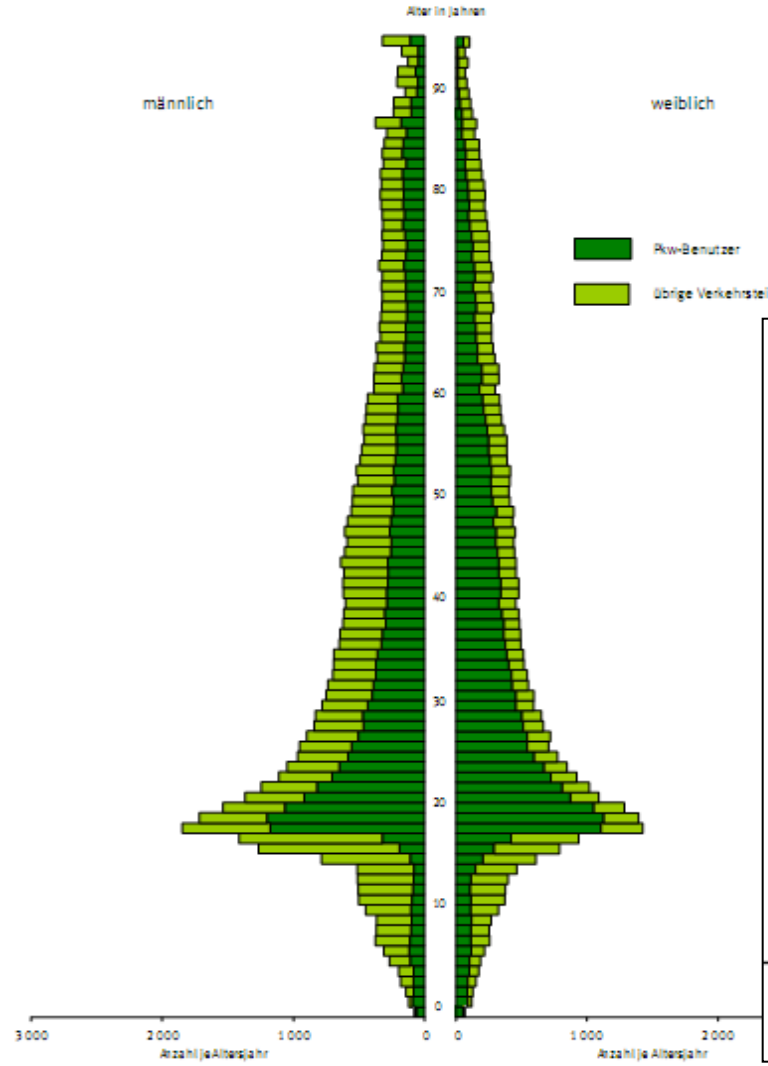
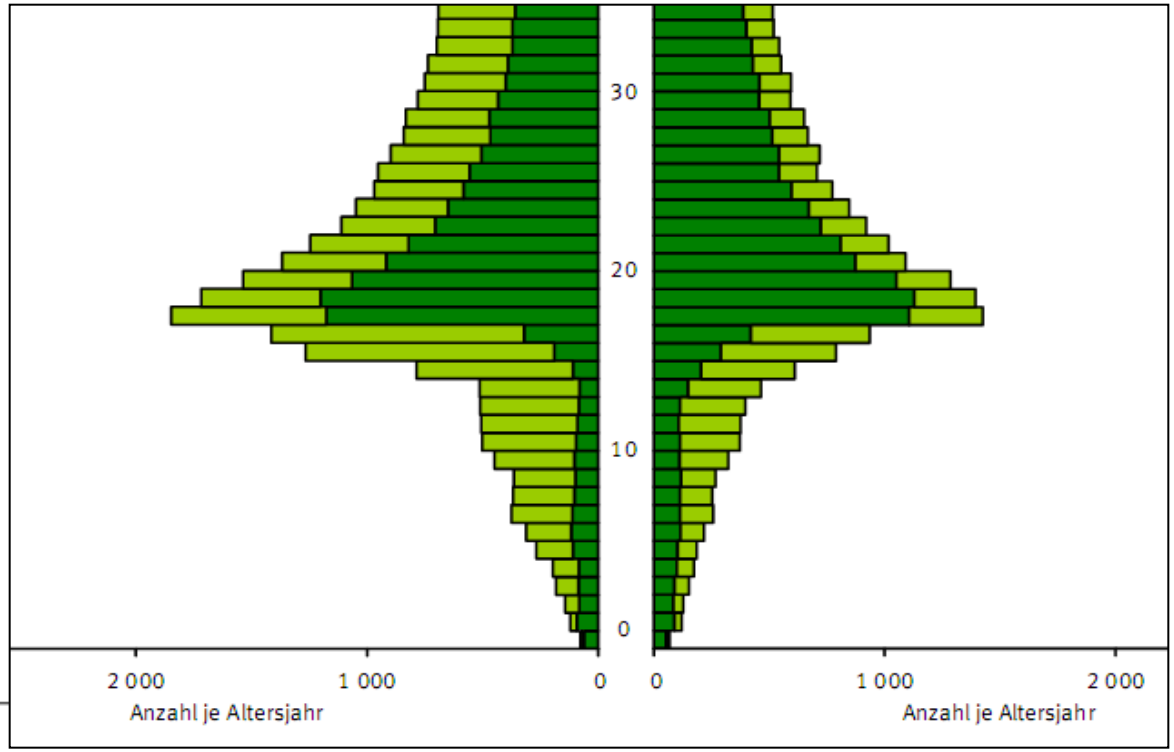
On behalf of bast

The Problem

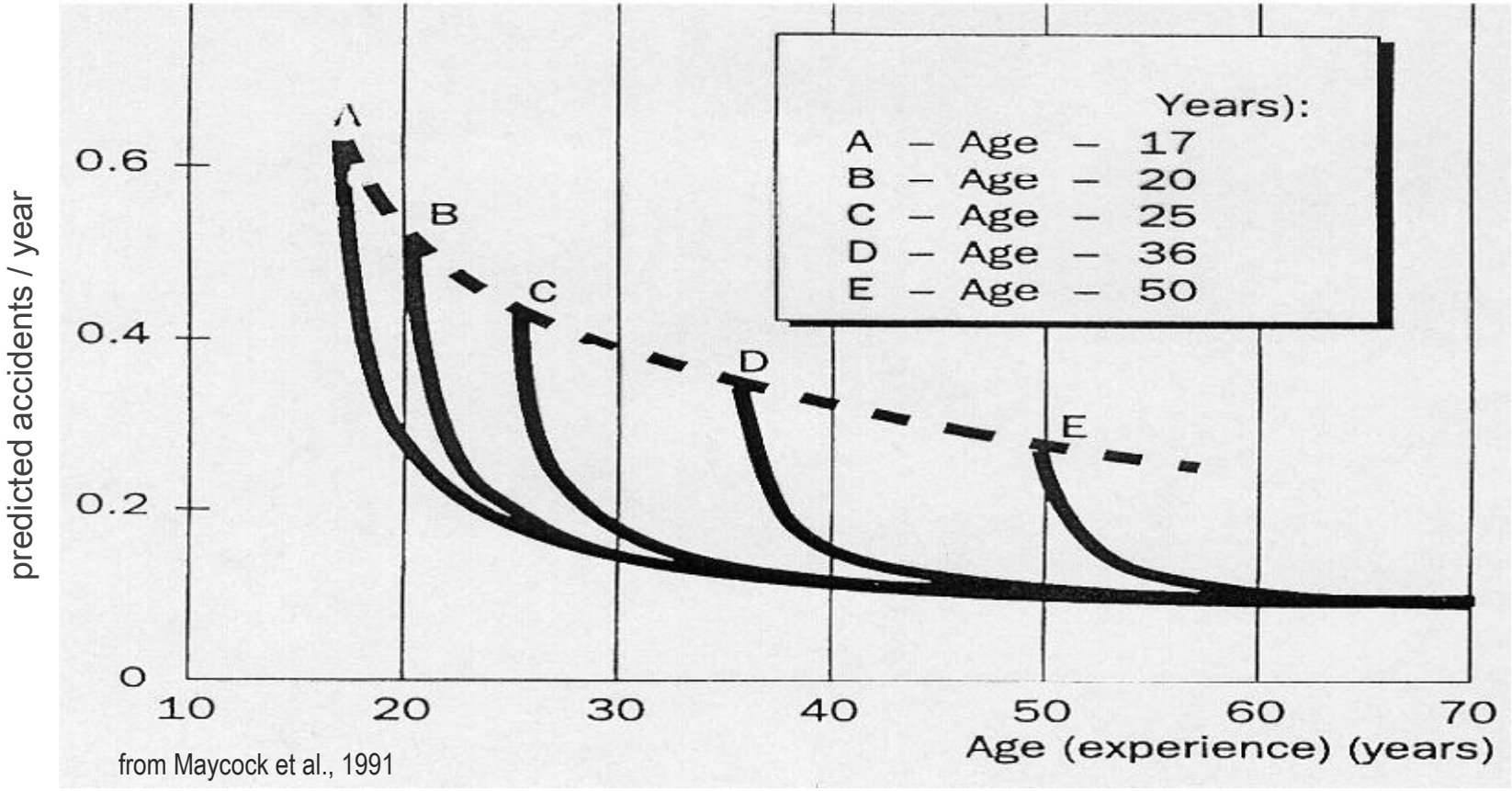


Road traffic accidents by age and 100,000 inhabitants

Statistisches Bundesamt, 2007

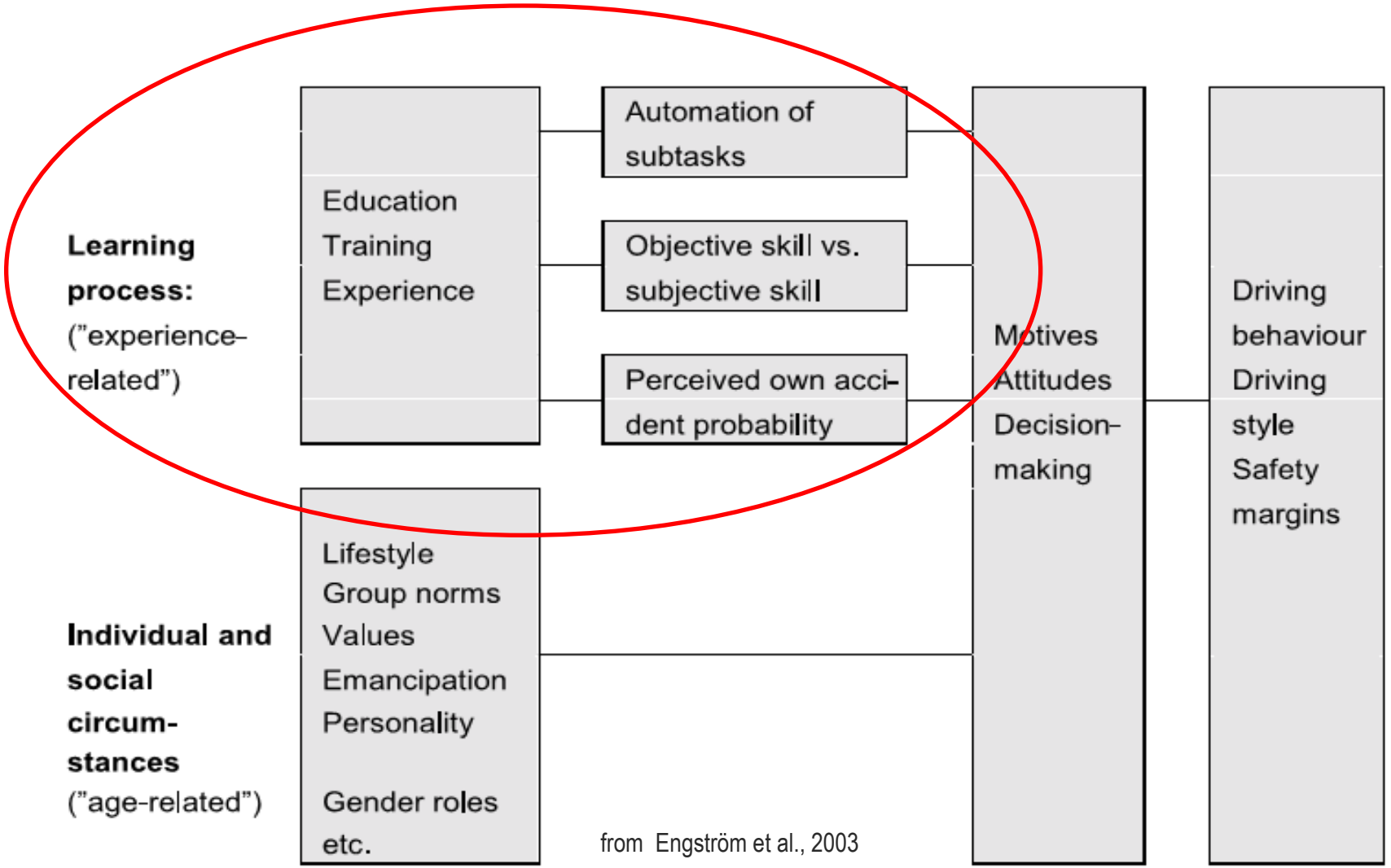


Accident involvement of younger drivers



from Maycock et al., 1991

Driver behaviour - Factors



from Engström et al., 2003

Challenges for novice drivers

- misjudgement in setting the right speed according to road and weather conditions (Clarke, Ward, & Truman, 2005)
- understanding of road users‘ signals (Renge, 2000)
- assessment of drivers‘ abilities and risky situations (Deery, 1999)
- visual search (e.g. Mourant & Rockwell, 1972; Crundall & Underwood, 2002)
- detection rate of potential hazards

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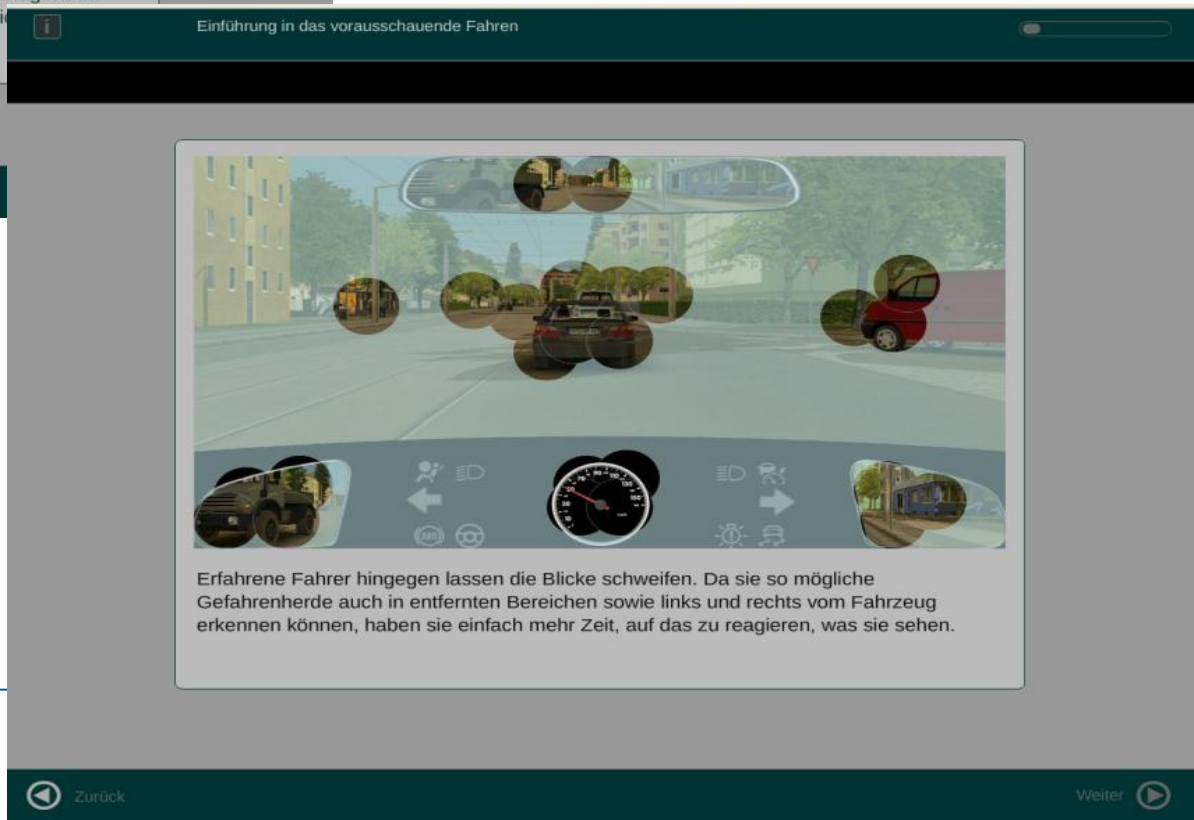
visual search



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Potential hazards

Challenges for novice drivers

- missing automation (motor & cognitive) of relevant procedures → overload & erroneous behaviour
  - gaze patterns differ from experienced drivers
    - glances mainly directly to the front & the right
    - rarely in the rear mirror
    - inefficient use of peripheral field of view
    - focus on smaller areas
  - hazard perception
    - problems for novice drivers to identify hazard indicators (& to react appropriately)
    - differences to experienced drivers especially in finding hazards farther away

Challenges – summary

- Young drivers have a lack of cognitive and metacognitive skills
- But these skills can be acquired comparatively fast

→ Deliberate practice, use of „new-media"

Multimedia applications

- (Driver) Education with multimedia applications
  - advantages:
    - various forms of presenting information possible (text, sound, video, animation, graphics)
    - various forms of interaction possible
    - adaptive feedback possible
    - flexibility (in terms of “when” and “where”) in use
  - examples:
    - DriveSmart (Australia)
    - CDDrives (New Zealand)
    - DriverZED (USA)
    - RAPT3 (USA)

Implications

- Implications for a multimedia based intervention
  - novice drivers use deficient strategies of information search and lack experience with critical elements in traffic
    - scenarios with critical elements in areas that novice drivers often neglect
    - select and repeatedly use critical elements typical for real traffic
    - create associations between driving situations, typical critical elements and appropriate search strategies
  - Differentiation between perceiving a situation, identifying critical elements and reacting appropriately
    - vary task and answer formats to allow for differentiation as well as integration of competences
    - increase realism in the tasks

Multimedia learning tool

- 2 learning sessions on hazard perception, 45 minutes each
  - 13 scenarios per session
  - 2-3 stops per scenario with multiple choice questions
  - different categories (categorized according to the position of the critical element)
  - Questions about elements within the situation
  - Feedback
- PC-based
  - Low-cost
  - Available everywhere
  - Implemented using “Vicom-Editor”, Arge tp21 (TÜV/Dekra Dresden)

An example

An example


Kreuz & Quer 4
6_1b_nass_b
Welcher der folgenden Aussagen würdest du zustimmen?
Der PKW in der rechten Spur wird in dieser Spur bleiben, weil der Bus gerade den Haltestellenbereich verlässt.
Der PKW in der rechten Spur sollte in dieser Spur bleiben und abbremsen, weil die Lücke für ein Überholen des Busses zu klein ist.
Der PKW wird gleich die Spur wechseln.
Ich werde wahrscheinlich nicht bremsen müssen.
Bestätigen

Evaluation

- Evaluation of the learning tool – Does it work?
- We tested the effects of the learning tool in a simulator study:
  - 3 groups
    - multimedia application training (as described before)
    - paper based training (same content as multimedia application)
    - control (no intervention)
  - 57 learner drivers
    - full theoretical education
    - minimum practical lessons
    - no previous license (motorcycle etc.)

Evaluation

1. training (multimedia & paper based group)
2. testing two days later (all groups)
   - driving simulator
   - two- & four lane urban courses (+ six lane highway)
   - scenarios partly close to training scenarios (to test near transfer of knowledge), partly only loosely associated with training scenarios (far transfer)
   - Dependent variable: gaze behaviour (+ driving data & questionnaires)
     - time of first glance to “unspecific hazard indicator”
     - time of first glance to “critical element”
     - time of first completion of glance sequence “unspecific hazard indicator” → “critical element”

Main results

- Computer based training (CBT) can have a positive impact on relevant driving skills
- CBT produces better results than a comparable classical form of instruction
- it appears that the CBT mainly affects glance behaviour, but also (however, to a smaller degree) situation comprehension

- **More details:** Petzoldt, T., Weiß, T., Franke, T., Krems, J.F., & Bannert, M. (2011). *Unterstützung der Fahrausbildung durch Lernsoftware.* Berichte der Bundesanstalt für Straßenwesen, Reihe M (Mensch und Sicherheit), Heft 219.

Conclusions

- multimedia training appears to be effective for certain scenarios
- multimedia training appears to be superior to paper based training
- provision of some form of “experience” through multimedia application seems possible
- **It is the combination of “traditional” driver education and CBT that counts**


Vielen Dank!