Training working memory in older drivers: The effect on cognitive ability and driving performance
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AIMS

1) IMPROVEMENT OF COGNITIVE ABILITY THROUGH A TRAINING OF WORKING MEMORY
2) IMPROVEMENT OF DRIVING PERFORMANCE THROUGH A TRAINING OF WORKING MEMORY

BACKGROUND

With age: decline in cognitive abilities, for example Working Memory (WM)
“The ability to temporarily store or manipulate information” (Baddeley, 1990)
WM is related to driving performance of older drivers
- Left turn performance among female drivers (Guerrier et al., 2002)
- On road driving performance (Adrian et al., 2011)
Ageing of society + consequences of driving cessation + costs of road accidents
- Need for effective interventions to keep older drivers safe drivers for as long as possible

Cognitive training improves cognitive abilities of older people
(Ball et al., 2002, 2007; Korbach & Kray, 2009; Rabois et al., 2014; Schmedtiek et al., 2010)
Moreover, cognitive training improves driving abilities of older drivers
(Ball et al., 2010, 2013; Cassavaugh & Kramer, 2009; Edwards et al., 2005; Roenker et al., 2010)
A cognitive training targeting WM improves cognitive abilities of older people
(Borall et al., 2010, 2013; Morrison & Chen, 2011; Richmond et al., 2011)
Positive transfer effects of a cognitive training targeting WM have been shown in different domains of behavior
- Problematic drinking behavior among adults (Houben et al., 2011)
- Motor activity among children with ADHD (Klingberg et al., 2002)
To our knowledge, solely one study investigated the effect of a cognitive training targeting visuo-spatial WM on driving performance of older drivers
- Accelerator response to lead-vehicle braking (Cassavaugh & Kramer, 2009)

METHOD

With a training with a limited difficulty level can

PARTICIPANTS
Age = 70.34 (4.49)
Mini-Mental State Examination (MMSE) score = 28.74 (1.27)

DRIVING PERFORMANCE
- Specific driving measures: fixed-based medium-fidelity driving simulator (STISIM 400; Systems Technology Incorporated)
  - Crashes (number)
  - Gap acceptance while turning left (s)
  - Giving right of way (yes or no)
  - Standard Deviation of Lateral Lane Position (m)
  - Speed (km/h)

COGNITIVE ABILITY
- WM: Automated Operation SPAN (AOSPAN, Unsworth et al., 2005)

WM TRAINING (Klingberg et al., 2002)
Procedure: 25 sessions at home via the internet
Experimental condition: Start = span previous session, Maximum span = 15
Control condition: Start = span 3, Maximum span= 3
3 training tasks: 1 = Visuo-spatial span  2 = Back digit span  3 = Letter span

DATA ANALYSIS

1) IMPROVEMENT OF COGNITIVE ABILITY THROUGH A TRAINING OF WM
Repeated measures ANOVA on AOSPAN: WS factor = Test (Pre; Post), BS factor = Condition (Experimental; Control)

2) IMPROVEMENT OF DRIVING PERFORMANCE THROUGH A TRAINING OF WM
Repeated measures ANOVA on driving measures: WS factor = Test (Pre; Post), BS factor = Condition (Experimental; Control)

RESULTS

1) IMPROVEMENT OF COGNITIVE ABILITY THROUGH A TRAINING OF WM

2) IMPROVEMENT OF DRIVING PERFORMANCE THROUGH A TRAINING OF WM

CONCLUSIONS AND DISCUSSION

WM in older drivers can be improved by training of that specific cognitive function
2) IMPROVEMENT OF DRIVING PERFORMANCE THROUGH A TRAINING OF WM IN OLDER DRIVERS
Driving performance of older drivers can be improved by a training of WM

FUTURE RESEARCH:
Investigate whether effects are due to a training effect or to a learning effect → collection of a passive control condition → Even a training with a limited difficulty level can have substantial effects → Promising tool to counteract or postpone decreases in cognitive ability and driving performance

LIMITATIONS
- Relatively low sample size due to simulator sickness
- Only investigation of immediate effects

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