Relationships of older drivers medical and mental conditions and their driving performance in on-road tests and accident involvement (BAST-Project “ELFI”)

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Dr. Herbert Gstalter
Functional Age:

1. Physical Fitness and health

2. Mental ability and performance

3. Social role, Identity, Personality

4. Traffic-related sociodemography

5. Driving behaviour

6. Driving quality
   - Self-reported errors
   - Accidents
   - Performance driving behaviour
Prediction of older drivers’ fitness to drive validated by Psychological Driving Behaviour Observation Measure

**Personality**
- Self-efficacy
- Compensation

**Sociodemography**
- Age
- Km traveled

**Mobility**
- Km traveled

**Physical health**
- Subjective health status
- Subjective joint-articulation

**Performance in driving behaviour observation**
- Performance in Concentration- and Reaction ability Determination-test (RST3)
- Peripheral vision / Divided attention (PVT)

**Psychometric testing**

**Accidents**
- Errors in Labyrinth-test (LL5)
List of errors / Segments

1  2  3  4  5  6

- Speed too fast
- Speed oscillating
- Inadequate acceleration
- Inadequate deceleration
- Headway too short (pushing)
- Closing a narrow gap (squeezing)
- Lateral distance too short to right side
- Lateral distance too short to left side
- No signals
- Signals too late
- Improper lane keeping at lane change
- Inaccurate lane use at queueing space
- Inaccurate lane use while turning
- Inadequate lane choice
- Adjustment too late
- Adjustment wrong lane
- Adjustment unsteady
- Deceleration too late
- Driving at yellow light
- Jumping a red light
- Not starting at green light
- Entering junction not yet cleared
- Persistent following
- Does not use queueing space
- Unassertive clearing of junction
- Too far into crossing traffic
- Unflexible at lane closures/bottlenecks
- Other signing errors
- Too far into pedestrian/cycle crossing
- Impedes pedestrians
- Impedes cyclists
- Perseverance on right of way
- Low checking ahead
- Low checking to left
- Low checking to right
- Low checking to rear
- Low lateral checking
- No checking (glance sequences)
Advantages of psychological driving behaviour observation

- Good acceptance due to high face-validity
- Fairness: at least on the manoeuvre- and control level of the driving task compensatory actions are possible
- Results of situational / driving task analysis based psychological driving observation measures are correlating with accident data
- Concrete feedback about driving performance; derivation of individual and tailored trainings
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**Performance in driving behaviour observation**

**Psychometric testing**
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- Peripheral vision / Divided attention (PVT)

**Accidents**
- Errors in Labyrinth-test (LL5)
Psychometric testing

- Concentration
- Reaction ability
- Orientation response
- Load capacity
- Attention / Attentiveness
Prediction of older drivers’ fitness to drive validated by Psychological Driving Behaviour Observation Measure

Personality
- Self-efficacy
+ Compensation
- Anxiety

Sociodemography
- Age
+ Km traveled

Mobility

Physical health
- Subjective health status
+ Subjective joint-articulation

Performance in driving behaviour observation

Performance in Concentration- and Reaction ability Determination-test (RST3)

Peripheral vision / Divided attention (PVT)

Psychometric testing

Accidents
- Errors in Labyrinth-test (LL5)
Accident rates (accidents of the last 3 years) in ELFI

![Graph showing accident rates vs. miles per year for different age groups.]
Prediction of older drivers’ fitness to drive validated by Psychological Driving Behaviour Observation Measure

**Personality**
- Self-efficacy
- Compensation

**Sociodemography**
- Age
- Km traveled

**Mobility**
- Accidents
  - Errors in Labyrinth-test (LL5)

**Physical health**
- Subjective health status
- Subjective joint-articulation

**Performance in driving behaviour observation**
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**Psychometric testing**
### Prognostic value of biographic, medical and psychological data for results of on-road tests

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Sensitivity [%]</th>
<th>Specificity [%]</th>
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<tr>
<td>Burgard &amp; Kiss</td>
<td>2008</td>
<td>82</td>
<td>75</td>
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<tr>
<td>Wood et al.</td>
<td>2008</td>
<td>91</td>
<td>70</td>
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<tr>
<td>Hoggarth et al.*</td>
<td>2013</td>
<td>63</td>
<td>57</td>
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<tr>
<td>Fastenmeier et al.</td>
<td>2014</td>
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<td>43</td>
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<tr>
<td>Poschadel et al. <strong>/</strong>*</td>
<td>2013</td>
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<td>85</td>
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<td>73</td>
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</tbody>
</table>

*cross-validation, ** ophtalmologic, *** medical
Conclusions/Recommendations

- Sensitivity and specificity of conventional test procedures and related measures are insufficient with respect to older drivers’ assessment.

- Psychological driving observation measures are a valid diagnostic instrument.

- Psychological driving observation measures could be a gold standard in assessing the driving performance of older drivers.

- It is important to rely on scientifically based and validated measures, using criteria such as objectivity, reliability, standardized test routes and observation sheets, adequate cut-off-criteria etc. Attention: Many currently used “on-road-tests” do not meet these criteria.
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Self-efficacy

Compensation

Anxiety

-0.51 **
(m -0.55; w -0.47)

-0.46 **
(m -0.51; w -0.33)

0.41 **
(m 0.52; w 0.28)