



Driver behaviour and abilities assessment of Greek elderly drivers

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The relevant problem

- Lack of standardised systematic procedures for assessing the fitness to drive of elderly drivers, which is due to the need for basic information, based on which rational policies can be developed for deciding who is, or not, qualified for licensure among the elderly population.



A few words about AGILE...

- EC-co-funded project; ended in March 2005
- It aimed, among other issues, at developing a new set of training and driving ability assessment tools for the elderly drivers, evaluating their full range of physical, cognitive, behavioural and interactional abilities, and not just checking a few sensory and motor functions.
- One of the tools that were developed within AGILE, are appropriate simulator scenarios, as part of elderly drivers driving ability assessment.



The driving simulator used

- Semi-dynamic (pitch, roll, vibrations)
- Based on SMART vehicle cabin
- Sight system: 200° fov (5 monitors)





Driving simulator scenarios - 1

- In total, 13 priority scenarios were elaborated.
- They focus on the main problems and traffic risks of elderly drivers, as identified by relevant literature, accidents and experts reviews



Driving simulator scenarios - 2

- Visibility (2 scenarios)
- Way finding
- Way finding with a navigation system
- ABS
- Yielding (2 scenarios)
- Yielding for jay walking pedestrian
- Yielding right of way
- Intersections of varying complexity, both left and right turns
- Merging
- Starting up in traffic
- Roundabout



Scenarios screenshots

Visibility



Yielding right of way with pedestrians



Roundabout



Way finding with navigation system





Participants

- In total, 98 participants (92 male and 6 female), above 55 years of age took part in the AGILE assessment, of which 2 did not undergo the simulator assessment.
- Thus results are presented for 96 subjects.



Procedure

- A preliminary test for drivers' familiarization with simulator ("Warm-up") took place.
- Then, participants were tested with five instead of the 13 scenarios, since a considerable number of cases of motion sickness was observed during preparation tests, especially in urban roads.
- The five scenarios were selected in order to be representative of the three AGILE-clusters of attention, based on scenarios' reference to GADGET Matrix and traffic situations' references to AGILE protocol.



Test scenarios

Scenario Reference to GADGET Matrix	Scenario Reference to AGILE Protocol	Simulator Scenario	Description	Duration (min)
-	-	-	Warm up	2:00
<i>Level 2: Knowledge and skill, risk increasing factors</i>	Visuo-spatial Skills	Merge	Merging in a highway	1:13
<i>Level 2: Knowledge and skill, risk increasing factors</i>	Basic Driving Skills	Startup	Starting up in traffic	1:13
<i>Level 2: Knowledge and skill, risk increasing factors</i>	Executive Functioning	Break Lights	Breakdown traffic lights	1:31
<i>Level 2: Risk increasing factors</i>	Non-spatial Skills	Right Way	Right of way	0:48
<i>Level 2: Knowledge and skill, risk increasing factors</i>	Non-Spatial Skills	Turn Left	Turning left	1:00
Total time				7:05



Results: simulator sickness

- Simulator sickness was noticed (increasing with time)
 - 27% of the participants stopped driving after 6-7 minutes of pure simulator driving, as they reported motion sickness.
 - Motion sickness was stronger when the scenario included tuning into vertical roads or driving on roads with curves.

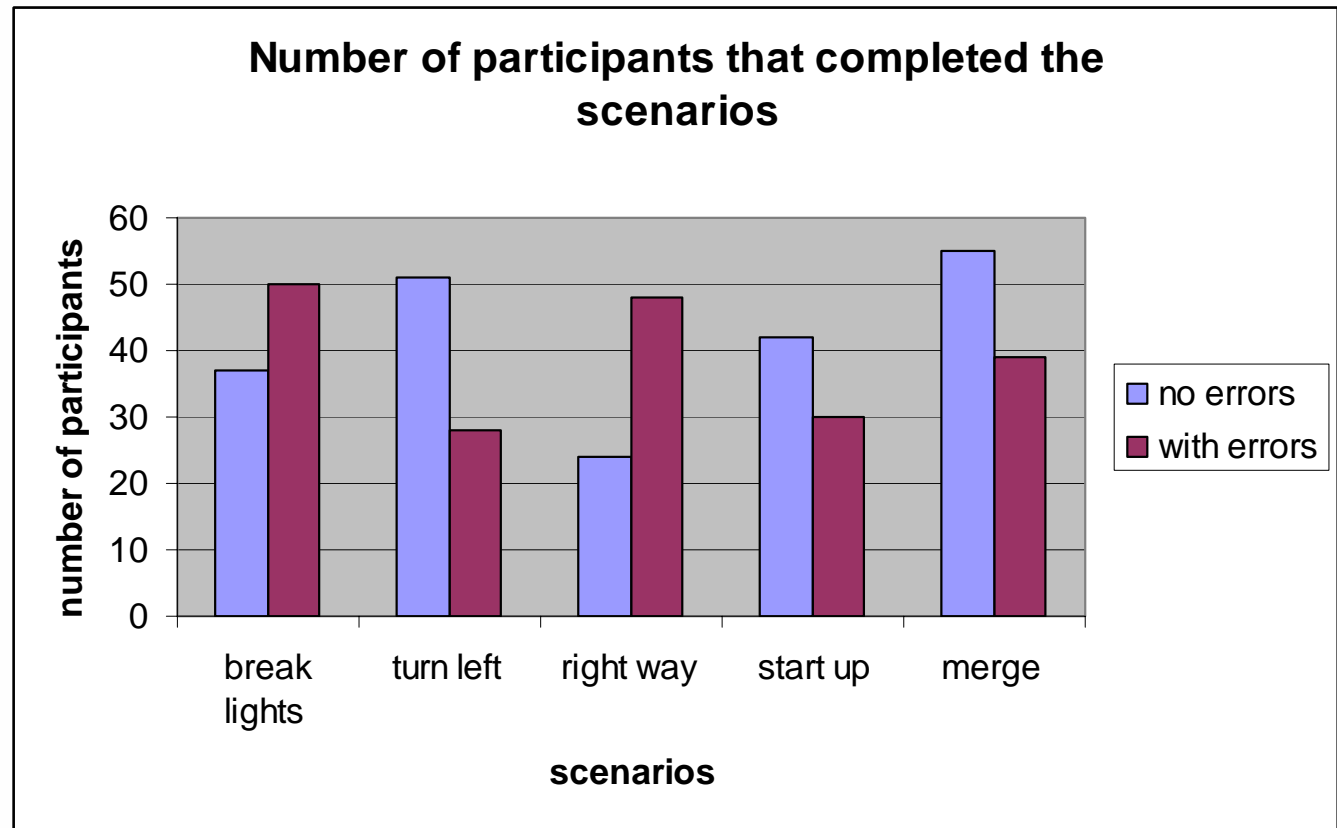


Results: Driving performance errors

- Most of the errors that were performed, as they were observed by the instructor and were recorded by the simulator, were:
 - Scenario “merge”: short headway (11 drivers)
 - Scenario “start up”: accident (11 persons) due to the omission in checking the side mirror when entering the traffic
 - Scenario “right way”: setting the light indicator to the wrong direction (35 persons out of 76, as the remaining did not perform the specific scenario due to motion sickness) and
 - exceeding the road borders (30 persons out of 76, as the remaining did not perform the specific scenario due to motion sickness)
 - Scenario “break lights”: disregarding the stop sign (29 persons)
 - Scenario “turn left”: disregarding the right of way (9 persons)



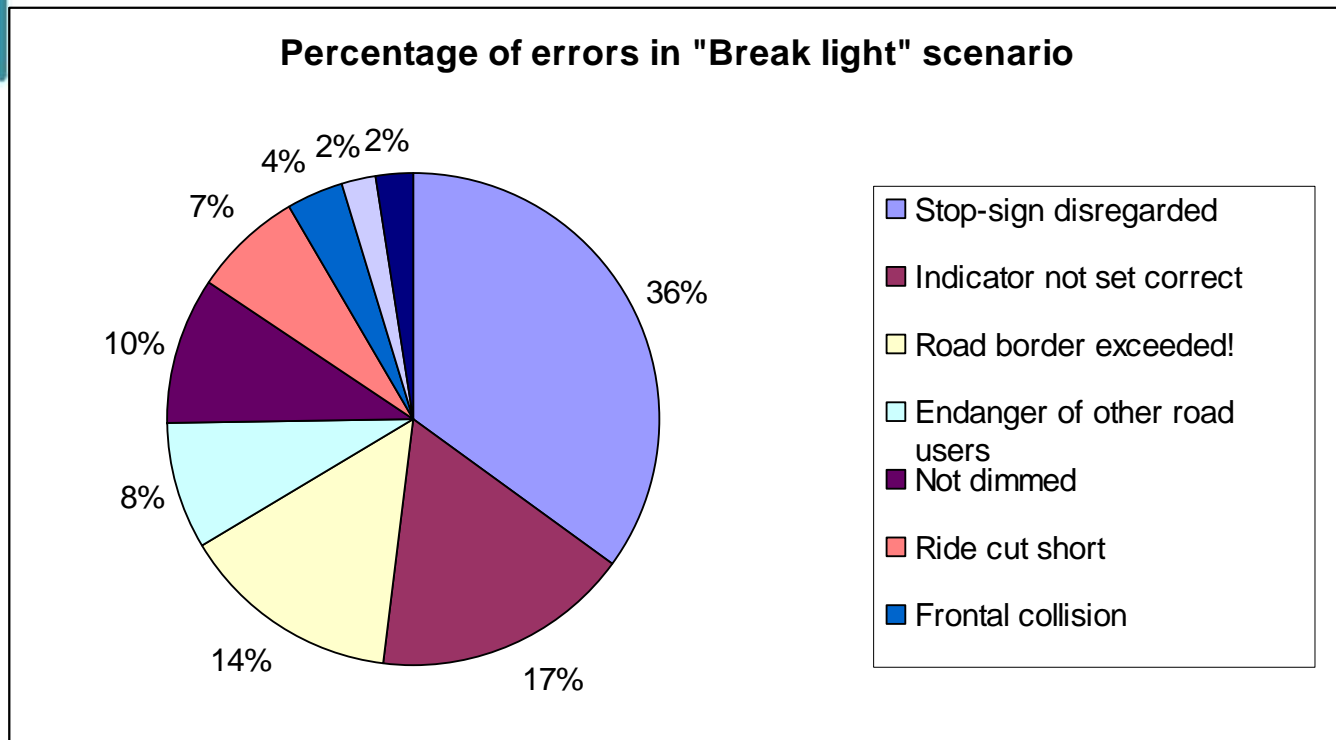
Results: Participants performance





Scenario “break lights”

- The scenario where the highest percentage of errors were performed





Results: Comparison with on-road results - 1

- There was no perfect match between the obtained results from the on-road assessment and driving simulator assessment.
- Nearly all the participants who were evaluated either as insufficient or doubtful, in terms of driving ability, according to driving expert judgment, performed relatively well within simulator assessment!



Results: Comparison with on-road results - 2

- The previous finding is not totally unexpected, as:
 - Simulator driving performance evaluation was exclusively based on the recorded errors. During the on-road assessment, driving performance was evaluated on the basis of subjects driving capability to operate the vehicle and to achieve a certain number of driving tasks in various traffic environments. This fact highlights the importance of assessors' subjectivity, taking into account that driving actions cannot be evaluated in a neutral manner, but in relation to the particular traffic context and the impact these may have for this context.
 - The selected simulator scenarios may be directional to the assessment of particular dimensions of driving behaviour, whereas on the on-road assessment a major focus was on driver's compensatory behaviour(s).



Conclusion - 1

- A total duration of about 8 minutes seems to be the optimum time for avoiding the unwanted effects of simulator motion sickness.
- Driving simulator provides a safe environment and the traffic scenarios offer only snapshots of real traffic. A fact which implies that, at least for some subjects, driving simulator performance does not necessarily correspond to their driving behaviour in real traffic, either because of their feeling of driving in an error-forgiving environment or because they do not interact in the same way with the other simulated-road users.



Conclusion - 2

- The tests revealed that clustering the simulator scenarios and using several driver behavioural parameters can be a useful tool for analysing deeply relevant elderly drivers' problems and guiding their subsequent on-the-road evaluation; but not a valid stand-alone assessment tool for judging their overall driving ability.
- The choice of appropriate assessment parameters and their thresholds, for their simulator assessment, requires still further research.