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**An investigation of older driver road safety perceptions
and driving performance on freeways**

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Older drivers' safety: An issue of concern

- Substantial increase in the number and proportion of older drivers' licensing rates along with an increase in driving exposure are expected in the next decades
- Accidents involving older drivers will more often lead to serious injuries and fatalities
- The “design driver” of the early 21st century will be an individual over the age of 65

Age and driving skills

- Changes in functional abilities that affect safe driving
 - Normal changes: vision, memory, physical strength and flexibility
 - Health conditions: illnesses (dementia)
- Compensatory actions, driving experience (anticipation), positive attitudes.
 - Older drivers drive less, avoid driving in difficult conditions and are largely more cautious drivers with conservative decision making

Age and driving skills

- ▶ **Self-regulation and compensation are well recognized.**

However,

older people do show changes in functional abilities which , in some cases, cannot be compensated for

- not all adaptation contributes to safety
- self-regulation is not always sufficient to preserve driver safety
- not all people with impairments self-regulate

Older drivers' self-assessment and perceptions

- They think that they are:
more cautious, more courteous and better drivers than younger drivers.
not significantly different from middle-aged drivers
- Perceived risk is greater in older than younger drivers
- Experienced older drivers are able to perceive more potentially hazardous situations than novices
- ▶ **However, any discrepancy between a driver's self-perceived ability and actual driving performance is crucial from a safety point of view**

Study Objectives

The investigation of:

- perceptions regarding road safety issues
- correlations between perceptions and driving assessment and self-assessment

METHOD

Study Participants

- Forty healthy licensed active male drivers 65 to 74
- Not involved in recent accidents
- They used their own car

Questionnaire on road safety issues

On-road trial

- 34 km section of an urban freeway

Protocol developed: <http://users.ntua.gr/sophiav/>

Self – assessment questionnaire

Questionnaire on road safety issues

- Situations Drivers Avoid Now and Used to Avoid 15-20 Years Ago
- Driver discomfort when driving on the freeway
- Driving practice when entering and exiting freeways
- Driving problems related to specific functional abilities
- Safe-driving ability
- Perception of potentially hazardous situations
- Engaging in risky behavior

METHOD

Performance Assessment

- Driving performance assessment was based on observations of driving behavior.
- Ranking of driving performance was based on task analysis

Satisfactory, Adequate, Nearly adequate, Questionable

Compensation ratings

- Performance of behavioral adjustments to ease the driving task, irrespective of their favourable or unfavourable safety outcome:
Yes, No

RESULTS – Rotated four factor matrix

Driver perceptions regarding their own safe driving ability

	1	2	3	4
Urban work zones	.827	.317	.139	.096
Rural work zones	.794	.277	.029	.139
Urban intersection	.792	.101	.368	-.175
Overtaking, freeways	.788	.150	.029	.285
Adjusting speed, urban roads	.705	.380	.046	.383
Exiting the freeways	.678	.033	.30	.288
Entering the freeways	.638	.131	.271	.348
Overtaking, rural roads	.596	.193	.449	.068
Driving at night	.056	.752	-.110	.003
Wet road	.474	.674	-.077	-.014
Unexpected hazard	.249	.668	.115	-.100
Heavy traffic, freeways	.190	.663	.455	.248
Searching freeway exit	.288	.658	.209	.475
Searching freeway entrance	.164	.595	.490	.355
Lateral positioning and direction	.184	-.021	.866	.012
Heavy traffic, urban roads	.452	.444	.461	.132
Adjusting speed, freeways	.182	.144	-.035	.841
Distance, vehicle in front	.319	-.389	.352	.591

RESULTS

Driver Perceptions Regarding their Own Safe Driving Ability

- ▶ four factors could explain 70.5% of total variance
 - Ability in maneuvering (28.3%)
 - ability in perceiving and reacting correctly in adverse driving conditions (19.3%)
 - ability in maintaining correct lateral position (11.9%)
 - ability in speed adaptation on the freeway (11%)

RESULTS

Driver Perceptions Regarding Average Driver Safe Driving Ability

- ▶ four factors could explain 74% of total variance
 - ability in overtaking maneuver (21.5%)
 - ability in driving through work zones (20.5%)
 - ability in complex driving tasks requiring attention sharing (19.3%)
 - driving ability in adverse environmental conditions (12.7%)

RESULTS

Differences in road safety perceptions (Wilcoxon Signed Rank Test)

Statistically significant differences in:

- ▶ the frequency of avoidance of certain situations over the period of 15-20 years
- ▶ driver perceptions of their own and the average driver's safe driving ability, both in general and specifically on freeways
- ▶ driver perceptions regarding their own risky behavior and that of the average driver

RESULTS

Road safety perceptions regarding the average driver

- ▶ the average driver is less safe driver than themselves both in general and on freeways
- ▶ the average driver engages in risky behaviors more often than they do

RESULTS

Frequency of avoidance of certain conditions

▶ Compared to 15-20 years ago, drivers more often avoid driving:

- under heavy rain
- conditions of limited visibility in unfamiliar areas
- on trips of more than 2 hours
- on the freeway in heavy traffic complex environments
- in the city
- on the freeway at night
- when tired
- at night
- in heavy traffic

RESULTS - Non parametric correlation, Kendall's tau

Self-assessment and awareness

- less favorable safe driving ability is correlated with
compensatory behavior ($\tau=0.408$, $p=0.008$)
visual search in lane change ($\tau=-0.436$, $p=0.002$)
 - perceived driving problems linked to cognitive abilities are correlated with lower performance in the on-road trial
 - drivers' perceptions regarding their own safe driving ability are consistent with self-assessed performance
- **drivers perceive their difficulties in driving**

RESULTS

Education and training

- less adequate knowledge regarding new traffic rules and traffic signs is correlated with decreased performance in lateral position and the use of mirrors
stated need to improve performance
- drivers with less recent driving activity report more frequent problems with lack of knowledge of new traffic rules and signs
- ▶ **drivers recognize the need to improve their performance**

RESULTS

Education and training

- Performance inadequacies in the on-road trial may be due to lack of knowledge of the appropriate performance, traffic rules and compensatory behavioral adjustments necessary for successful task execution
 - Freeway maneuvering, visual search and hazard recognition are related to factors underlying driver perceptions regarding their own safe driving ability
- ▶ **drivers might be motivated to improve their performance in those tasks**

RESULTS

Infrastructure

- Familiarity with the specific freeway is correlated with better performance , more favorable self-assessment and perceived greater discomfort when exiting freeways
- More frequent reported problems of delayed reaction are related to a stated need for assistance in exiting, through freeway conditions improvements
- More frequent problems with flexibility as well as with concentration and sustained attention are combined with a stated need for assistance in entering freeway through infrastructure improvements.

CONCLUSIONS

- Drivers may be aware of their reduced driving skills and recognize the need to improve their performance.
- Study participants
 - seem to have a general awareness of their driving performance,
 - perceive the average driver as less safe than themselves at safe driving,
 - they think that the average driver engages in risky behaviors more often than they do.

CONCLUSIONS

- Four factors underlie drivers' perceptions regarding their own safe driving ability
- Four factors underlie drivers' perceptions regarding the ability of the average driver. They may indicate drivers concerns regarding specific driving situations and environments

CONCLUSIONS

- More frequently reported problems related to certain cognitive functions are correlated with a stated need for assistance in exiting and entering maneuvers through infrastructure improvements.
- Drivers more familiar with the specific freeway, perform better in some aspects of driving behavior, assess their performance in freeway exiting more favorably, and experience greater discomfort when exiting freeways.
- When drivers report more frequent problems with delayed reactions, they state a need for better freeway exit design and particularly exit signing.

EXPLOITATION OF FINDINGS

Self-screening and education

- Self-screening instruments assisting older drivers in developing a critical attitude toward their driving and strengthening their conscious awareness of the need to adapt.
- Training in safe practices, compensation strategies and tactics, particularly in tasks in which drivers may get a feedback and may be motivated to improve e.g. visual search techniques, divided attention tasks, maneuvers.

EXPLOITATION OF FINDINGS

Forgiving roadway environment

older drivers should be provided with more time and information with:

- decision sight distance (instead of Stopping Sight Distance) to downstream exits or split points

FURTHER RESEARCH

- Association between safety perceptions and functional abilities, as well as between assessed and self-assessed performance and functional ability
- Perceived driving problems, perceived safe driving ability and self-regulation as well as performance in a variety of situations and driving tasks, in relation to clinically assessed cognitive functioning, warrant investigation