The impact of neurological condition on driver distraction in a driving simulator experiment: Preliminary findings

A. Economou[1], I. Beratis[2], M. H. Kosmidis[3], A. Liosidou[2], N. Andronas[2], J. Papatriantafyllou[4], G. Yannis[5], S. G. Papageorgiou[2]

[1]Department of Psychology, University of Athens, [2]"Attikon" University General Hospital, Department of Neurology, University of Athens, [3]School of Psychology, Aristotle University of Thessaloniki, [4]IASIS Community Medical Center for the Elderly, Glyfada, [5]Department of Transportation Planning & Engineering, National Technical University of Athens , GREECE

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BACKGROUND

Age-related neurological disorders may affect driver distraction, and medication may also impair driving. In the early stages, neurological disorders have little impact on daily life yet may significantly impair one's driving ability. Mild Cognitive Impairment (MCI), the predementia stage of Alzheimer's disease (AD) and various dementing disorders, is associated with impaired driving to a small extent (Fritteli et al., 2009) and self-reported road accident involvement is associated with future diagnosis of dementia (Lafont et al., 2008). It is unknown whether distraction affects the driving ability of neurology patients to the same extent as healthy persons. Because of the ageing population, the need to investigate this question becomes critical.

AIMS

To present preliminary findings from a funded programme, National Strategic Reference Framework (NSRF 2007-13, O.P. Thales), on causes and impacts of driver distraction in a driving simulator experiment.

To examine driving with and without distraction in patients and control participants, focusing on two measures of driving performance:

a) driver behavior: driver speed and lateral position of vehicle in lane,
b) safety parameters: accident probability, reaction time in unexpected incidents

Additional measures will include variability in speed and lateral position, and recall of safety information.

MATERIALS & METHODS

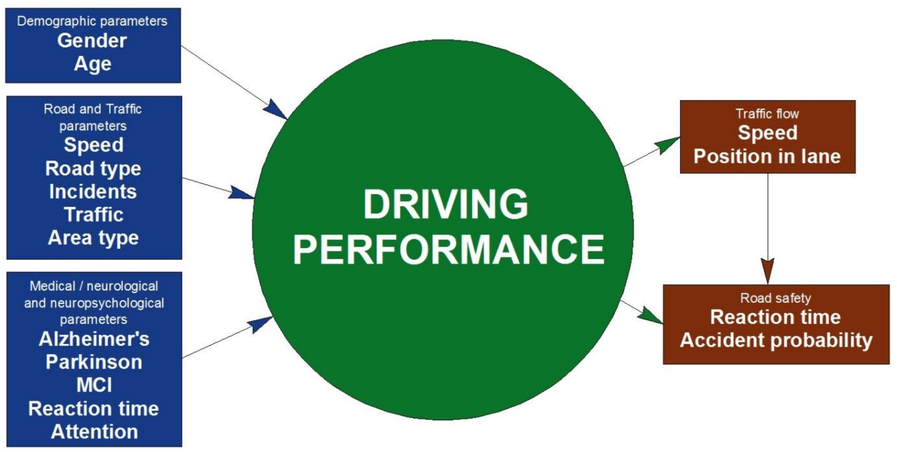
Sample characteristics:

A sample of at least 175 participants with neurological disease will be recruited over a period of 2 years. Control participants will be free of known pathological condition and will be matched to the impaired group for age.

Age	Impaired	Healthy	Total
> 55	125	75	200
< 55	50	50	100
Total	175	125	300

DESIGN

Conceptual design of the experiment



Assessment: Neurological, ophthalmological, neuropsychological & personality

Driving conditions: Urban & rural driving with & without distraction, under moderate & high traffic volumes

A motorway driving session with low, moderate, & high demand conditions riving performance

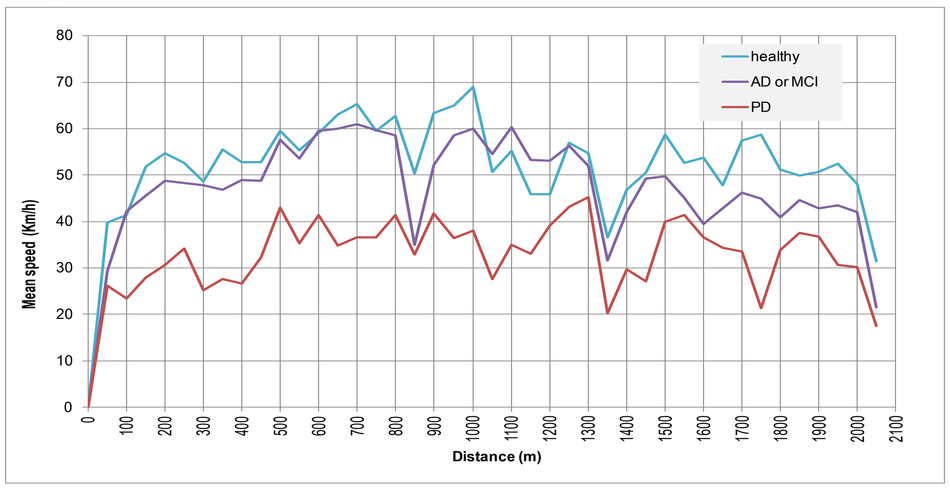
Outcome measure: driving performance

FOERST Driving Simulator FPF quarter-cab simulator with a motion base

PRELIMINARY RESULTS

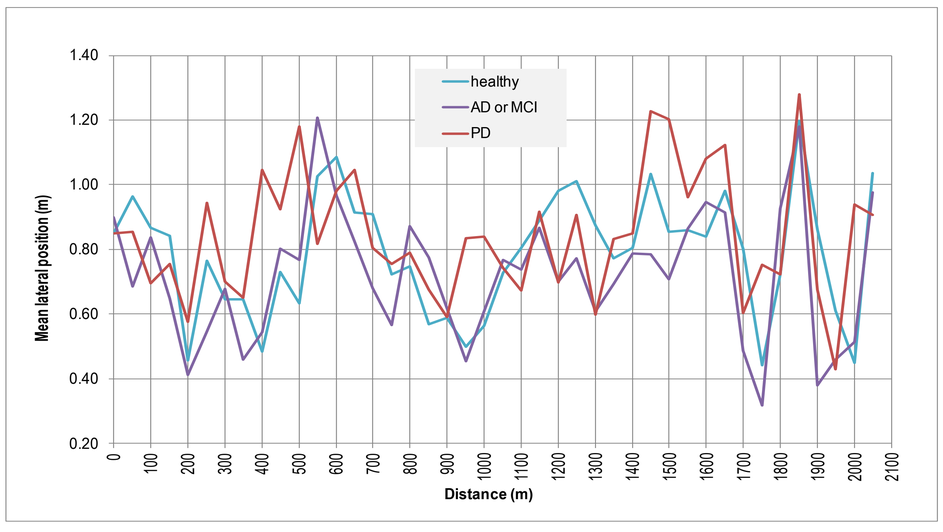
Results from 18 impaired drivers: 13 MCI or early AD patients, 5 Parkinson's disease (PD) patients, and 7 healthy control drivers

Figure 1



Mean speed of healthy and impaired drivers in the rural area, moderate traffic volume, no distraction condition

Figure 2



Mean lateral position of healthy and impaired drivers in the rural area, moderate traffic volume, no distraction condition

Fig. 1. Impaired drivers, especially PD patients, drove at lower speed than controls, but exhibited similar speed profiles, with speed reductions at 0.85 and 1.35 km, which correspond to the two unexpected incidents.

Fig. 2. The lateral position differences among the three groups of drivers is less pronounced (lateral position is the vehicle's distance from the right road border, in metres).

CONCLUSION

Pilot data suggest that PD patients compensate for their procedural learning deficits by reducing speed.

Mean speed appears to be a more sensitive measure of driving performance than mean lateral position.

The results of future analyses of larger samples will be exploited for making safety recommendations.

REFERENCES

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aoikono@psych.uoa.gr

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