Mild Cognitive Impairment: The role of in-vehicle distraction in driving behavior

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INTRODUCTION

- Individuals with MCI as compared to cognitively intact individuals show more commonly driving difficulties according to evaluations assessing various driving indexes, namely mean time to collision, left-hand turns and lane control. Nonetheless, on the average their driving performance is not consistently worse than that of their healthy counterparts [1, 2, 3].
- One of the most important in-vehicle distractors appears to be the use of mobile phone [19, 20, 21, 18]. Among a set of 14 common types of driver distraction, the highest perceived risk appeared in the case of mobile phone use whereas "conversing to passengers" was considered as one of the distractors with the lowest perceived risk [4].
- Previous research has not explored the role of distraction on the driving behavior of patients with MCI, a common condition with a high prevalence in the group of older drivers [5].
- Patients with MCI appear to be commonly affected in divided attention procedures and, therefore, a driving condition including in-vehicle distraction could prove to be a really hard task for drivers with MCI.

AIM

The goal of the present study was to explore the role of in-vehicle distraction on critical road safety measures, namely reaction time at unexpected incidents and accident probability, in drivers with MCI, by applying a driving simulator experiment.

METHODS

Participants:

- 13 patients with MCI
- 12 healthy controls (HC)

The diagnosis of aMCI were made by the Petersen & Morris (2005)

Inclusion & Exclusion Criteria:

- have a valid driving license
- regular drivers
- CDR: MCI ≤ 0.5
- not have significant psychiatric history of psychosis
- not have any significant motor disorder
- not have any significant visual disorder

Procedure:

First phase: All participants went through a two-day medical/neurological, neuropsychological and ophthalmological assessment in order to well document the presence of a disorder and its characteristics

Second phase: driving behaviour evaluation by applying a driving simulator experiment that included different driving scenarios

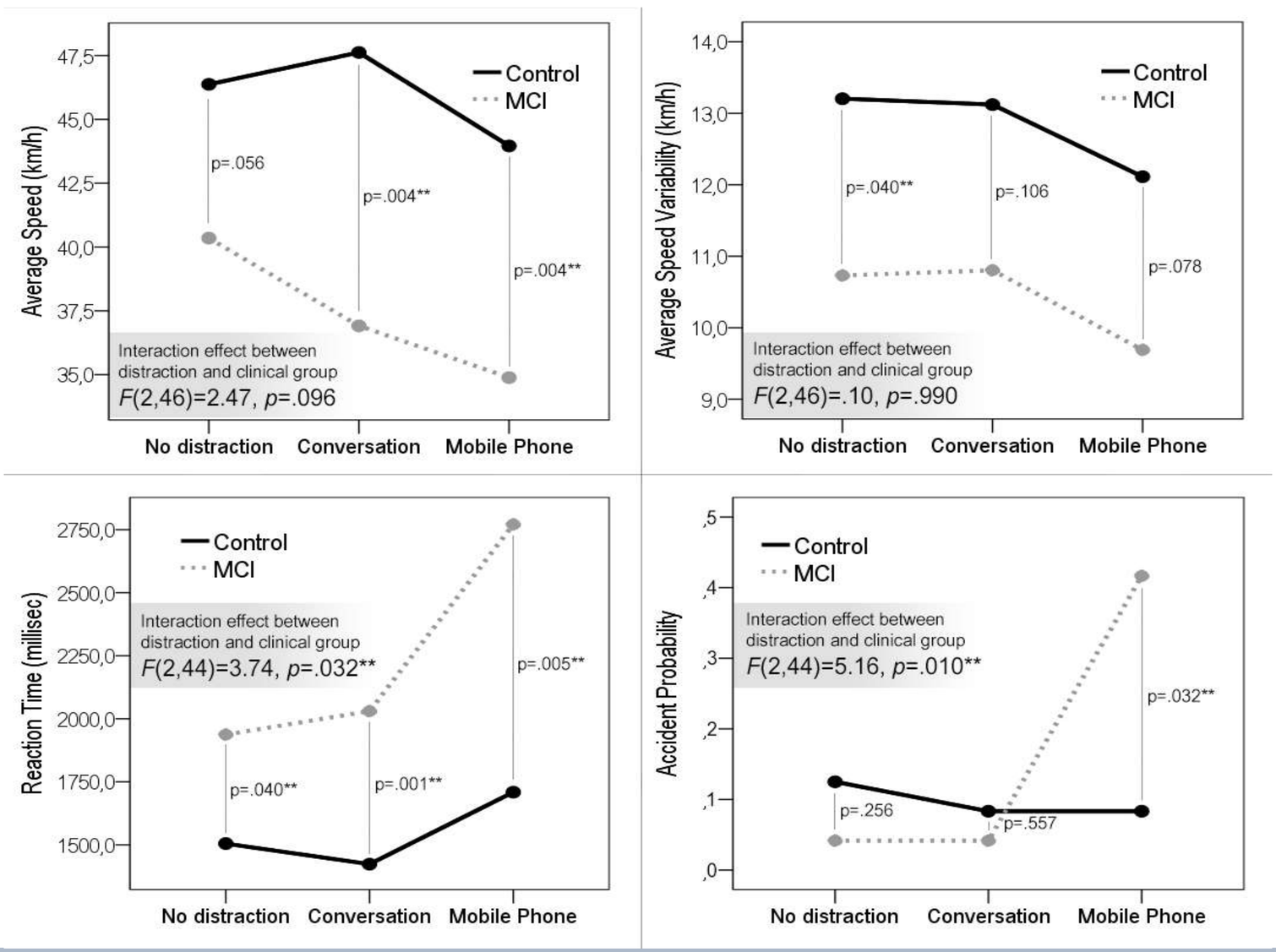
- Practice session (5-10 min.)
- Driving in a **rural environment** : 2.1km long rural route for each distraction condition, single carriageway with 3m lane width, zero gradient and mild horizontal curves. The **traffic volume conditions** in the session were medium, corresponding to an average traffic volume Q=300vehicles/hour.
- The **three distraction conditions** concerned: a) undistracted driving, b) driving while conversing with a passenger and c) driving while conversing through a hand-held mobile phone
- An **unexpected incident** occurs in each of the two sessions (sudden appearance of pedestrian or child on the road, sudden appearance of an animal on the rural road)
- Driving was assessed with **a Foerst FPF driving simulator**

RESULTS

Table 1. Comparison of patients with MCI and of a Control group without neurological history on various neuropsychological tests

	MCI group	Control group	P-values
MMSE	28.0±2.0	29.4±0.8	0.035
Hopkins Verbal Learning-Immediate Recall	17.5±4.5	26.3±3.1	<0.001
Hopkins Verbal Learning-Delayed Recall	3.8±3.0	8.6±2.5	<0.001
Symbol Digit Modalities Test	33.3±12.5	50.4±7.9	0.001
Judgment of Line Orientation (JLO)	15.6±2.8	17.1±2.3	0.172
Trail Making Test-Part A	53.7±10.9	38.3±10.1	0.001
Trail Making Test-Part B	141.9±81.7	75.3±30.5	0.015
Letter Number Sequencing	7.9±2.9	10.9±1.7	0.005

Figure 1. Speed, speed variability, reaction time and accident probability profiles



CONCLUSION

- The detection of this strong adverse effect of the mobile phone on the driving fitness of individuals with MCI could be explained by their reduced cognitive resources, especially during the performance of divided attention procedures.
- The pattern of findings that was observed in the condition with conversation suggests that this very common driving habit could alter the driving behavior of MCI patients in ways that could be potentially dangerous as indicated by the marked increase of their reaction time.
- Overall, these observations may have considerable practical importance because they provide useful information for the formulation of efficient driving recommendations that have the capacity to reduce the risk for road fatalities in a sensitive group of car drivers

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