The value of the Mini Mental State Examination (MMSE) and Montreal Cognitive Assessment (MoCA) in the prediction of fitness to drive in patients with amnestic Mild Cognitive Impairment (aMCI) and mild Alzheimer’s disease (AD)

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Introduction - Background

• Mini Mental State Examination (MMSE) and Montreal Cognitive Assessment (MoCA) are commonly used screening tests for the evaluation of general cognitive ability.
• Previous studies, investigating the relation between MMSE and driving ability, have revealed contradictory results.
• Hollis et al. (2015), is the only study so far, that has examined the MoCA comparatively to MMSE in performance in order to predict driving fitness, indicating stronger associations of MoCA with driving performance in cognitively impaired individuals.

The main objective of the present study was to explore whether the MoCA would present stronger overall associations with driving performance than the the widely used MMSE.

In addition, a second goal of the current work was to explore whether the MoCA would present stronger overall associations with driving performance than the MMSE, widely used WMSE.

“Driving at the simulator” assessment

• Quarter-car driving FOREST simulator (validated against a real world environment)
• 3 LCD wide screens 42” (full HD: 1920x1080pixes) with total of view field 170 degrees.
• At first, one practice drive (10-15 minutes).
• Then, the participant drives two sessions (~10 minutes each)
• Each session corresponds to a different road environment:
  - A rural route (1.7km long), single carriageway, separated by guardrails, two traffic control junctions, one stop-controlled junction and one roundabout are placed along the route.
  - During each session, two unexpected incidents occur: sudden appearance of an animal on the roadway, and sudden appearance of a car chasing a car on the roadway or a car suddenly getting out of a parking space.

Analysis and methods

• Pearson r correlations were carried out in order to assess the association between the MMSE and MoCA performance with driving performance measures for each group: average speed, Lateral position, Headway distance, Reaction time, Accident probability, and Speed limit violations.

Results - Pearson r correlations - Control Group:
• No significant correlations were found between the MMSE, MoCA and the driving indexes in the group of cognitively intact individuals.

Results - Pearson r correlations - aMCI patients:
• In aMCI patients, MMSE and MoCA scores were significantly correlated with reaction time and the accident probability in both urban and rural environments, while non-significant correlations were observed in the remaining driving indexes in neither rural nor urban areas.
• MoCA was significantly correlated with speed limit violations in the rural environment.
• No other significant correlations were observed between the MoCA performance and the rest of the driving indexes.

Results - Pearson r correlations - AD Patients:
• In AD patients, MMSE performance significantly correlated with headway distance in the rural environment and with accident probability in the urban environment.
• MoCA performance was significantly correlated with headway distance, average speed in the rural environment as well as with accident probability in the urban environment.

Conclusions - Discussion

• Both MMSE and MoCA were associated with crucial driving indexes that have an integral link with overall driving fitness.
• In patients with aMCI, both neuropsychological indexes were associated with the critical measures of reaction time to unexpected incidents and accident probability.
• In addition, the MoCA scores were significantly associated with speed limit violations in the rural area.
• In patients with AD, MoCA has a slight advantage as compared to MMSE regarding the number of significant associations that were observed with fitness to drive related measures.
• In the mild AD group, headway distance in the rural area and accident probability in the urban area presented significant associations with both cognitive screening tests.
• MoCA was also associated with average speed in the rural area.
• MoCA appears to have a slight advantage as compared to MMSE also in the case of patients with mild AD.
• Importantly, our findings indicate absence of significant associations between the driving variables and both MMSE and MoCA performance in the healthy elderly group.

MoCA and MoCA are effective for detecting associations with fitness to drive in patients with mild to mild AD but not in the case of the cognitively healthier elderly group. It is concluded that the MoCA and MoCA are useful neuropsychological measures of global cognitive functioning, with a relative advantage of the MoCA, that may facilitate the effort for detecting those patients with aMCI and AD with problematic driving skills.

ACKNOWLEDGEMENT
This research was performed within the framework of "IKY Fellowships of Excellence for Postgraduate Studies in Greece - SIEMENS Program"