DRIVING PERFORMANCE AND MCI: THE INFLUENCE OF NEUROPSYCHIATRIC SYMPTOMS

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16 Annual Meeting of the ICGP & 5th International Congress on Psychiatry and the Neurosciences 2016

INTRODUCTION

- Mild cognitive impairment (MCI) is created to define the beginning of cognitive changes in the absence of dementia (Dubois and Albert, 2004).
- Recent studies address the presence of neuropsychiatric manifestations in MCI population with most common the symptoms of aggression, irritability, depression, anxiety and apathy (Apostolova and Cummings, 2008; Gallagher et al., 2011).
- Considering that individuals with MCI are at high risk of developing dementia (Petersen, 2004), their driving performance and safety have provoked great concerns.
- Although no significant differences between normal and MCI drivers have been observed, on-road and simulator experiments have addressed upcoming difficulties among the MCI group (Frittelli et al., 2009; Wadley et al., 2009).

➢ Therefore, the influence of NPS on basic driving parameters must be investigated thoroughly .

OBJECTIVES

The aim of this study was to examine the relationship between Neuropsychiatric symptoms (NPS) and the driving performance of MCI patients.

PARTICIPANTS & METHODS

- 31 patients (Age=70.9±9.4) with amnestic MCI-multiple domain (if other domains are impaired in addition to memory) participated in the study (Petersen et al., 2005).

- **Inclusion criteria*:*** valid driving license, regular driving (3days/week), absence of any self-reported accidents, 0.5 score in the Clinical Dementia Rating Scale (CDR).

➢ **Phase 1.** Neuropsychiatric evaluation in order to identify the presence of neuropsychiatric characteristics with the use of Neuropsychiatric Inventory (NPI) and Patient Health Questionnaire (PHQ-9) which evaluates the depressive symptoms.

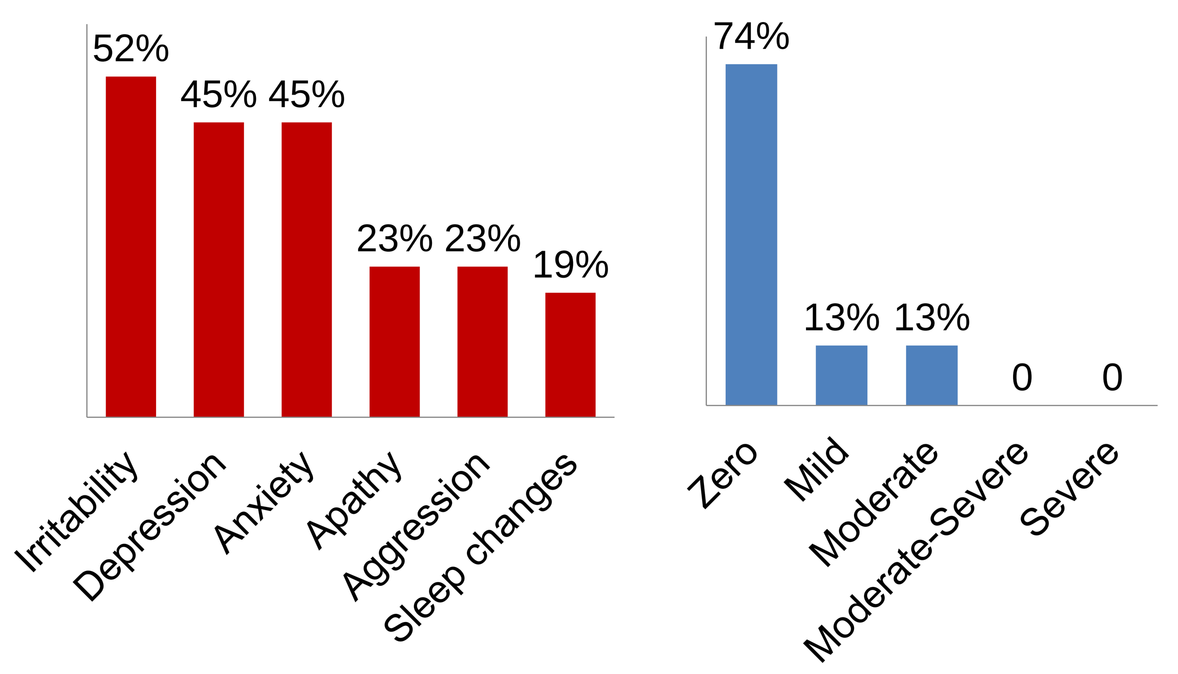
➢ **Phase 2.** Driving with a Foerst FPF, ¼ cab simulator. Driving included a practice session (10-15 min), and a driving session which included the following conditions:

- **2 road environments**
  Rural: 2.1 km
  Urban: 1.7 km
- **2 traffic scenarios**
  Low volume: 300 vehicles/hour
  High volume: 600 vehicles/hour
- **2 unexpected incidents**
  etc. donkey at rural road
  child chasing a ball or a sudden appearance of a car at urban road

➢ **Outcome measures**: average speed in km/h, distance from the ahead driving vehicle in m, frequency of engine's deactivation (driving error), average reaction time towards an unexpected incident in msec and accident probability (%).

RESULTS

Chart 1. Frequencies of Neuropsychiatric Symptoms in the MCI group



1. Simple regression models were applied in order to study the capacity of various NPS to predict the driving measures of interest.

A. Rural area

(Low traffic)
Irritability predicted the frequency of engine's deactivation [R^2= .17, F (1, 22) = 4.69, p<.05]
PHQ-9 predicted the average speed [R^2=.200,F(1,20)=5.02,p<.04]

(High traffic)
Depression (NPI) predicted the frequency of the deactivation [R^2= .243, F (1, 22) = 7.079, p<.05]

B. Urban area

(Low traffic)
Depression [R^2= .184, F (1, 21) = 4.74, p<.05], Anxiety [R^2 = .251, F (1, 21) = 7.05, p<.05], Sleep disturbances [R^2= .172, F (1, 21) = 4.37, p<.05] and PHQ-9 [R^2= .483, F (1, 19) = 17.75, p<.001] predicted the deactivation of the engine

(High traffic)
Anxiety[R^2= .443, F (1, 18) = 6.30, p<.005] and PHQ-9 [R^2= .356, F (1, 17) = 9.40, p<.01] predicted the average reaction time

2. Those NPS that reached the level of statistical significance were introduced in stepwise multiple regression models for exploring their unique contribution on the prediction of driving behavior.

Table.1 Multiple regression results for NPS predictors in low traffic condition

Multiple regression	Frequency of Deactivation		
Low traffic	B	SE B	β
Anxiety	0.27	.11	.40*
Sleep changes	0.29	.09	.46**
PHQ-9	0.27	.12	.34*

R^2= .70, Adjusted R^2 = .65 , ***p < .001; ** p < .01; *p<.05

- Anxiety, sleep changes and PHQ-9, explained the 70% of the total variance of the deactivation

Table.2 Multiple regression results for NPS predictors in high traffic condition

Multiple regression	Reaction time		
High traffic	B	SE B	β
PHQ-9	49.33	16.09	.60**

R^2 = .37, Adjusted R^2 = .32, ***p < .001; ** p < .01; *p<.05

- Only PHQ-9 explained the 37% of the total variance of the reaction time

DISCUSSION/SUMMARY

- This study has shown for the first time a possible link between a number of NPS and the driving ability of MCI drivers.
- Under the rural condition, depression and irritability were related to more driving errors such as the frequency of engine's deactivation, whilst PHQ-9 was related to the average speed.
- In urban road, depression, anxiety, sleep disturbances and PHQ-9 were also related to the frequency of engine's deactivation. However, in high traffic, anxiety and PHQ-9 found to be related to a slower reaction time under unexpected incidents.
- Overall, the NPS showed a unique contribution on the driving measures of interest mostly under the urban area, indicating an upcoming difficulty under more demanding environmental settings.
- Considering that even mild neuropsychiatric symptoms can influence the driving performance of a-MCI drivers the expressed NPS might increase the possibility of a future driving risk among these individuals.
- A more detailed evaluation of the psychopathology in MCI patients is suggested in order to assess the severity of symptoms and their impact on driving behavior, as risk factors.
- Individualized interventions must be applied especially in the stage of MCI, in order to improve their driving behavior before progressing to dementia.

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ACKNOWLEDGEMENTS

➢ *This paper is based on the helpful sponsorship of the Operational Program "Education and Lifelong Learning" of the National Strategic Reference Framework (NSRF) – Research Funding Program: ARISTEIA. The European Union (European Social Fund – ESF) and Greek national funds, also co-funded this project*