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CLINICAL MANIFESTATIONS

POSTER PRESENTATION

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Cognitive functioning and simulated driving in older adults with and without cognitive impairment

David M. Brush[1] | Carol Persad[1] | Woojin Song[2] | Eva Jansohn[1] | Bruno Giordani[1]

[1]University of Michigan, Ann Arbor, MI, USA

[2]University of Illinois at Chicago, Chicago, IL, USA

Correspondence
David M. Brush, University of Michigan, Ann Arbor, MI, USA.
Email: brushd@med.umich.edu

Abstract

Background: Age-related changes in cognitive functions affect complex task engagement such as driving. Studies have demonstrated high occurrences of driving errors and crashes among older adults, particularly those with mild cognitive impairment (MCI). We have previously demonstrated that fatigue contributes to detriments in driving ability, especially among MCI, and that attention-maintenance tasks (AMT) improve older cognitively normal (OCN) but not MCI performance. This study considers which cognitive deficits predict driving performance across AMT conditions.

Methods: Participants included 34 OCN and 21 MCI adults age 60+ years diagnosed through consensus conference, who completed tests of memory (HVLT-R delayed recall), executive functioning (Trail Making Test B; TMB), working memory (CogState One Back Test, ONB), simple reaction time (CogState Detection Test, DET), and choice reaction time (CogState Identification Test, IDN). Computerized driving scenarios were presented on a 45" flat screen monitor, which included a 50-minute simulated drive designed to induce fatigue, followed by four 10-minute sessions alternating between driving with and without AMT. Lane position, velocity, lane and velocity variability, and driving errors (e.g., leaving the road, crossing midline) were compared across 10-minute driving segments. Cognitive measures and diagnosis were used to predict driving performance.

Results: Participants with MCI 1) maintained significantly slower average speed, 2) demonstrated higher variability in lane-keeping, and 3) had greater velocity variability, only in the non-AMT condition. OCN participants performed significantly better on all cognitive measures, except DET. Linear regressions showed that TMB, alone, predicted average velocity during the AMT driving condition with no significant predictors for the non-AMT. Velocity variability during the non-AMT driving condition was predicted by the main effect of Diagnosis, TMBxDiagnosis, and ONBxDiagnosis interactions. TMB and HVLT-R predicted velocity variability during the AMT condition. Lane variability during both driving conditions was predicted by DETxDiagnosis and IDNxDiagnosis.

Conclusions: Performance on TMB and its interactions are predominantly important predictors for velocity-related driving conditions. Reaction time decrements among those with MCI predict lane variability. This suggests that executive functions are particularly needed in maintaining velocity, while monitoring is critical for maintaining lane position. Our findings demonstrate that higher cognitive burden likely accentuates driving difficulty, especially in MCI.