Driver performance in different road conditions with and without distraction offers valuable information concerning driving safety, yet it is difficult to investigate during on-road driving. Alzheimer’s disease (AD) and Parkinson’s disease (PD) patients make different kinds of safety errors on road tests, which likely reflect their respective deficits. The nature of their driving errors is difficult to examine during on-road driving due to lack of control of traffic parameters and safety reasons. Herein, we present initial findings on driving measures of neurology patients and healthy controls in three rural driving simulation environments: Moderate Traffic with No Distraction, High Traffic with and with No Distraction. The study aims to examine the contributions of traffic load and distraction to measures of driving behavior in the above groups.

Materials and Methods

Participants

In these analyses, 63 drivers participated: 22 controls (mean age 56.36 ± 8.89), 22 mild cognitive impairment (MCI) patients (mean age 66.41 ± 10.00), 8 mild AD patients (mean age 73.13 ± 8.81), and 11 PD patients (mean age 63.64 ± 10.96). Number of patients entering each analysis varied. Measures

Average speed (in km) in each condition.

Lateral position of the vehicle (in m) from the right road border.

Average distance (in m) from the vehicle ahead.

Average time to collision (in sec) with vehicle ahead (projection).

Data collection

Measures were taken during a 42 min. drive on a Foerst FPF driving simulator. Specifically, measures were taken from 3 driving environments: Rural Moderate Traffic no Distraction, Rural High Traffic no Distraction, Rural High Traffic with Distraction (conversation). Each driving condition lasted 3:30 min. and took place on a two-lane rural road.

Preliminary results

Univariate analyses of variance were performed for each of the measures, with group as fixed variable and age as covariate, comparing each patient group to the control group. (Figures shown unadjusted for age).

Discussion

Both AD and PD patients drove slower than controls in the High Traffic No Distraction condition. Slower speed may represent an adaptation to challenging traffic situations in cognitive decline (and aging), as well as impaired motor control. AD patients increased their distance from the vehicle ahead in the High Traffic condition irrespective of distraction, and consequently took more time to collision (a projection) than controls, which likely reflects a compensatory strategy for driving difficulties in the more demanding, high traffic environments. PD patients increased their distance from the vehicle ahead and consequently took more time to collision than controls in both Moderate Traffic and High Traffic No Distraction conditions, which likely reflects a compensatory strategy for motor slowing irrespective of traffic volume. Moreover, they deviated more from the road in the High Traffic No Distraction condition, reflecting poor motor control. Small patient samples in these preliminary analyses may conceal other group differences. Larger sample sizes will confirm and extend the above findings in this ongoing study.

References
