PARKINSON’S DISEASE AND ALZHEIMER’S DISEASE DIFFERENTIALLY IMPACT EGOCENTRIC AND ALLOCENTRIC NAVIGATION LEARNING ON VIRTUAL REALITY TESTS

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Although PD and AD patients can suffer from profound spatial deficits, the nature of these deficits is poorly understood. We hypothesized that PD selectively impacts egocentric (self-based) spatial navigation learning but spares allocentric (world-based) navigation, whereas early AD severely impacts allocentric navigation. Using virtual reality technology, we developed the Egocentric Route Learning Test (ERLT) and the Allocentric Morris Maze Test (AMMT) to approximate paradigms used to evaluate navigation in rodent models of dementia. The ERLT engages caudate-based stimulus response learning in an egocentric reference frame. The AMMT engages the hippocampally-based development of a cognitive map based on distal cues. We studied 14 PD patients, 7 early AD patients, and 12 age-matched controls. Learning slopes were analyzed using linear mixed effects models and 30-minute delayed recall was analyzed using standard ANOVA. On the ERLT, PD patients showed a markedly reduced learning slope compared to controls, \(p<.001\), and were less accurate at delayed recall, \(p<.001\). In contrast, PD patients performed normally on the AMMT. Learning slopes of early AD patients were reduced on both tasks (\(p<.001\)), but delayed recall was more profoundly impacted on the AMMT. Thus, PD may impact egocentric navigation but spare allocentric, whereas early AD most profoundly impacts the retention of allocentrically coded information. Results suggest the egocentric-allocentric distinction can distinguish PD- and AD-related cognitive impairment. Further, virtual reality technology can be used to approximate rodent paradigms, which ultimately could allow more accurate prediction from basic science research how new treatments will impact disease in humans.