

Spatial Navigation Skills In Mild Cognitive Impairment (MCI) and Alzheimer's Disease (AD) – A Meta-Analysis

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Abstract

Spatial navigation deficit is an early marker of Alzheimer's Disease and Mild Cognitive Impairment, and can be identified as a precursor to more severe neural impairment. By analysing the performance of older adults in spatial navigation tasks, it is possible to determine the severity of the impairment as well as the correlation their performance has with their neurological diagnosis.

Methods

The present meta-analysis compares the results between the performance of older adults diagnosed with MCI and older adults diagnosed with AD. The data used is the accuracy score when asked to recreate a route shown, for example, either in person or virtually, or using a pen and paper, or being shown a route and then asked which way to turn when the route is replayed. To accurately assess the magnitude of the effect size, the fundamental standardized mean difference (Hedge's g) was employed. Furthermore, characteristics such as publication year, study location, participant age, gender, and education, were explored alongside a variety of tests, (real world vs. virtual reality), types of measures (time and accuracy), as well as spatial navigation tasks and spatial navigation activities meant to supplement the primary spatial navigation test.

Background

Dementia exerts significant influence on both individuals and societies globally. Mild Cognitive Impairment (MCI) is a transitional stage between normal cognitive aging and dementia. However, Alzheimer's Disease (AD) is a more advanced and severe form of cognitive decline. Spatial disorientation emerges as one of the initial signs of Alzheimer's Disease (Coughlan et al. 2018). It seems that early signs of cognitive decline related to MCI may be evident through challenges in spatial navigation skills. The ability to reliably navigate your environment is a crucial skill that affects an individual's daily life and spans circumstances and environments. Navigation in itself is a complex skill, containing multiple subskills that must successfully work together to create an overall performance. While, similar to many other facets of mental cognition, spatial navigation is expected to decline as a part of normal aging processes, what is interesting is the clear differences between navigation in an individual with Alzheimer's Disease and an individual without.

Results

Current data consists of 69 effect sizes across 26 studies. These studies represent 1359 participants (682 MCI, 677 healthy older adults). However, a greater number of participants and statistically significant samples would be necessary in order to determine this research.

Conclusion

The current data does suggest that adults with Alzheimer's Disease are less successful when it comes to spatial navigation tasks than adults with Mild Cognitive Impairment. However, given the large effect size, it is worthwhile to examine potential moderators. It would also be useful to assess the effect size for spatial navigation in people with Alzheimer's Disease, which can be more precisely compared with a larger sample of data.

References

Kossowska-Kuhn, Dorota & Charness, Neil. (2023). SPATIAL NAVIGATION SKILLS IN MILD COGNITIVE IMPAIRMENT (MCI) – A META-ANALYSIS. *Innovation in Aging*. 7. 1120-1121. 10.1093/geroni/igad104.3598.