



Semantic Memory for Biological and Artifact Items in Mild Cognitive Impairment

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Introduction

- Amnesic Mild Cognitive Impairment (a-MCI) is often a prodromal form of Alzheimer's disease. It is characterized by noticeable cognitive changes, including memory impairment [1].
- Current research suggests that semantic memory, the memory subtype that represents acquired conceptual knowledge and learned words, is affected in a-MCI.
- The semantic memory changes in MCI are reflected in decreased semantic performance compared to healthy older adults (OA).
- The Boston Naming Test (BNT) and Novel Naming Task (NNT) are picture-naming tests that measure semantic retrieval ability for Artifact and Biological Items. The semantic impairment in MCI appears to be greater for semantic information that is biological in nature [2]. This is likely because Artifact Items are more familiar and memorable due to their consistent presence in daily life. Furthermore, Artifact Items are distinguishable based on semantic information relating to their function as tools, as well as their physical appearance. Conversely, the main identifier for Biological Items is external appearance.
- Biological Items can be divided into Food and Animal sub-categories. While Animal Items are distinguishable based on outward appearance, Food Items have more identifiers (ie use in cooking, taste) and are more common in everyday life.
- Current findings suggest a sex difference in naming task performance. Males appear to outperform females on the BNT in both healthy OA and MCI samples [3]. This implies that males may have superior semantic retrieval ability.
- The present study examined the impact of MCI and sex on naming performance.

Hypotheses:

- Compared to healthy older adults (OA), MCI patients will name fewer pictures correctly overall.
- MCI patients will have more extensive impairment for Biological Items than Artifact Items.
- Within the Biological Items category, MCI patients will make more naming errors on Animal Items than on Food Items.
- Male participants will outperform female participants in both MCI and healthy OA groups.

Methods

Participants

- Participants were monolingual English-speaking OA and MCI patients.
 - All participants had only limited exposure to other languages.
- All participants completed a battery of neuropsychological assessments including the MoCA, Stroop Test, WCST, and other tests of executive functioning.
- MCI patients were enrolled in the Bruyère Memory Program and had been diagnosed by a neurologist or geriatrician prior to participation.

Table 1: Participant data

	Older Adults (n= 60; 35 Female)	MCI Patients (n=16, 8 Female)
Age	71.73 ± 6.09	75.81 ± 4.76
Education	15.22 ± 2.74	16.47 ± 3.43
MoCA	27.73 ± 1.48	23.81 ± 3.35
WCST	3.68 ± 1.24	2.80 ± 1.42
Stroop 1	95.14 ± 15.35	85.07 ± 21.63
Stroop 2	66.77 ± 12.91	52.36 ± 15.98
Stroop 3	34.53 ± 7.60	26.5 ± 9.48

Tasks and materials

- **BNT and NNT:** The BNT is a 60-item black and white picture naming task. The NNT is 120-item task composed of 100 coloured picture items from the Snodgrass pictures, and 20 novel images designed to be of higher difficulty. All participants completed both the BNT and NNT, in which they were shown a series of images depicting either Biological Items (e.g., plants, animals) or Artifact Items (e.g., furniture). Their responses were recorded and scored.
 - A subset of 49 Artifact Items (13 from BNT, 36 from NNT) and 49 Biological Items (13 from BNT, 36 from NNT) was selected from both tests.
 - The selected items from both tests were matched for ranked difficulty across item categories.
 - Within the Biological Items category, performance differences for Food Items vs Animal Items were analyzed.

Results

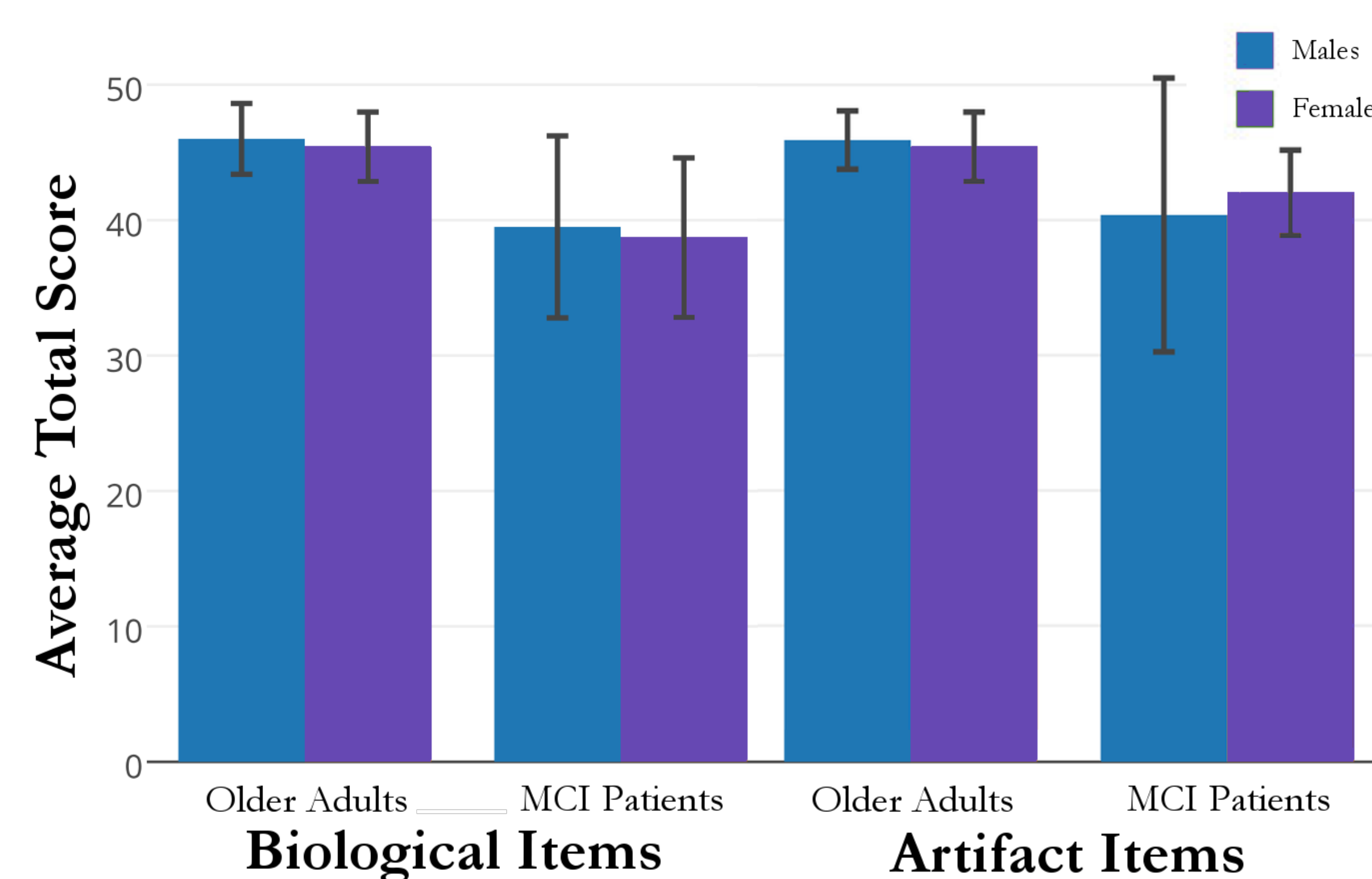


Figure 1. The OAs outperformed the MCI patients. There were no significant category or sex differences in overall naming ability. Standard deviation is shown.

- OA named more images than MCI patients overall ($p < 0.011$), and on Biological Items ($p < 0.001$) and Artifact Items ($p < 0.001$)
- There is no significant effect of sex on overall naming ability ($p = 0.577$)
- There is a significant effect of sex and group on naming performance in Animals vs Food items; female MCI patients outperformed male MCI patients on Food Items, ($p = 0.022$)
 - This effect was not present for OA.

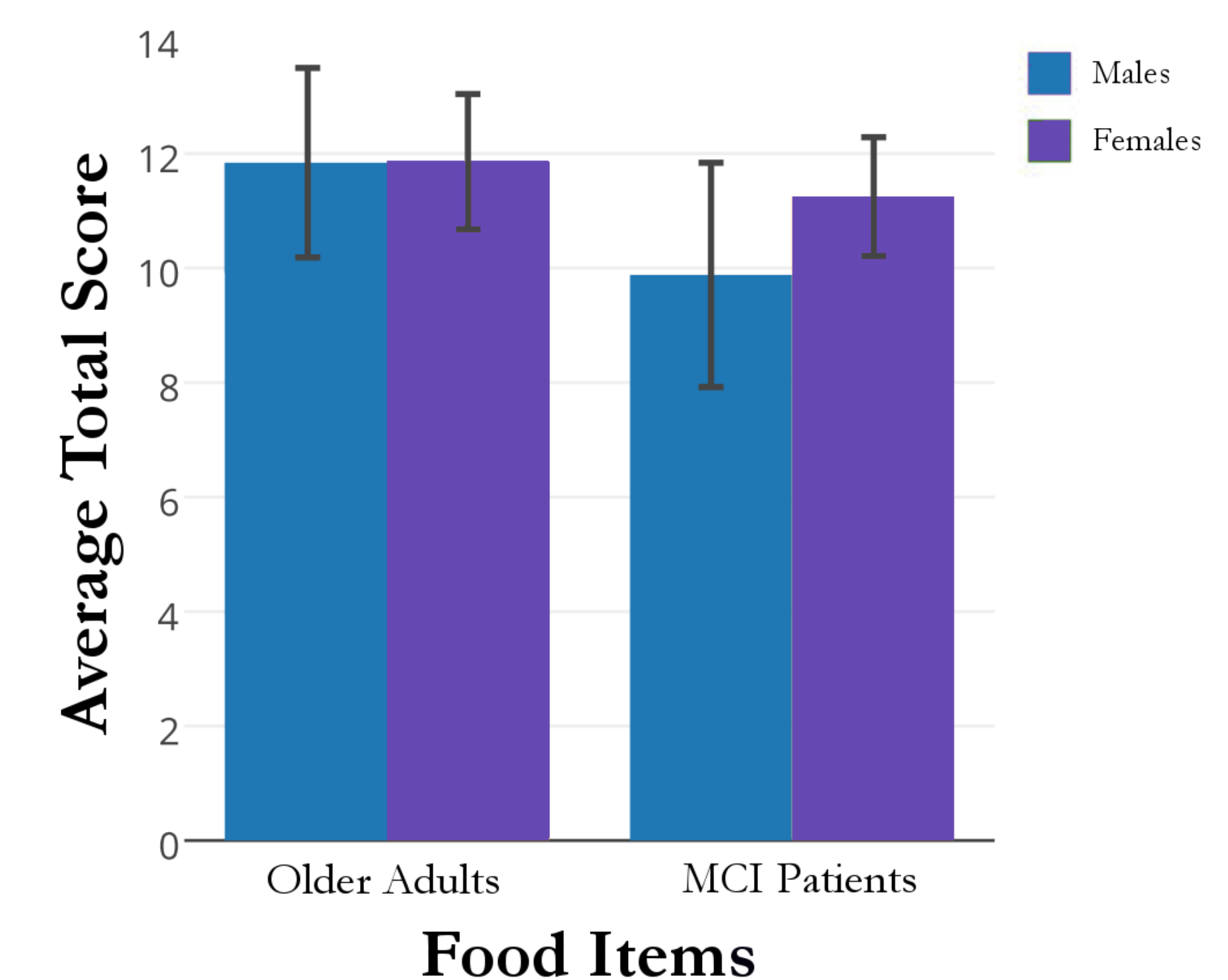


Figure 2. Female patients outperformed males on naming Food Items in the MCI condition. Standard deviation of average scores is shown.

Conclusions

- Semantic memory and related skills are impaired in individuals with MCI.
- Tests of semantic memory may be used to confirm MCI diagnoses and measure disease progression.
- The results deviated from the expected results and previous research. These discrepancies may be explained in part by this study's restricted sample size, which is its greatest limitation.
 - There was no significant difference in patient performance on Artifact Items vs Biological Items.
 - There was no significant sex difference in overall naming ability.
 - There was no significant difference in MCI patients' naming errors between Animal Items vs Food Items.
- Within the MCI group, females outperformed males on Food Items. This may be indicative of a cohort effect; female participants' upbringing was likely influenced by traditional gender roles, which place great emphasis on home economics, including food preparation. Increased familiarity with food items may have had a protective effect on food-related semantic information in MCI.
- Further research is needed to determine the exact nature of the semantic memory changes in MCI.

References

- [1] Petersen, R. C. (2011). Mild Cognitive Impairment. *The New England Journal of Medicine*, 364, 2227-2234.
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- [3] Way, S., & Gracer, T. S. (2007). Geriatric Performance on an Abbreviated Version of the Boston Naming Test. *Applied Neuropsychology*, 14(3), 215-223.

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