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The route less travelled: Assessment of procedural memory in dementia

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AGING & COGNITION RESEARCH CLINIC

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Background

Memory impairments are the cardinal, earliest-appearing clinical symptom in Alzheimer's disease (AD). Indeed, a clinical diagnosis of probable AD requires the presence of persistent impairments of memory. Nearly two decades of empirical evidence supports the existence of two subdivisions of long term memory - **declarative and nondeclarative memory**. Declarative memory comprises episodic, semantic, and lexical memory. Nondeclarative memory comprises, procedures, habits, conditioned responses, and priming. This architecture of human memory has significant applications for clinicians, particularly relative to identifying strengths, assessing restorative potential, and planning intervention. Several researchers have concluded that whereas declarative system is more impaired in dementia, nondeclarative memory is relatively spared (Harrison, Son, Kim, & Whall, 2007; Bayles & Kim, 2003; Bayles, Hopper, & Kim, 2001; Fleischman & Gabrieli, 1998).

Purpose

The purpose of this research report is to **compare the immediate and delayed recall of narratives (short stories) and routes by persons with dementia (PWD)**.

We considered a route recall task to tap into nondeclarative memory because participants demonstrated a 5-point route around the room with no verbal/declarative recall.

Methodology

25 persons with mild to moderate dementia (21-AD, 4-VaD) completed immediate and delayed recall of short stories and demonstrations of a spatial route around a large room.

These tasks were completed during standardized assessment using the **Rivermead Behavioral Memory Test** (RBMT-2; Wilson, Cockburn, & Baddeley, 2003). Participants also completed the **Dementia Rating Scale** (DRS-2; Jurica, Leitten, & Mattis, 2001) to assess global cognitive status. Additionally, participants received screenings for hearing, vision, and depression.

Participant Demographics

Mean Age	84.6 years (Range: 75-96)
Mean Yrs of Education	12.9 years (Range: 9-19)
Gender	7 M, 18 F
Ethnicity	22 Caucasian, 1 Latino, 2 Asian
Mean MMSE Score	21.5/30 (Range: 13-28)
Dementia Rating Scale-2	Mean Age- and Education-Adjusted Mental Status Scores (AEMSS)=7.2 (Range: 1 – 9)

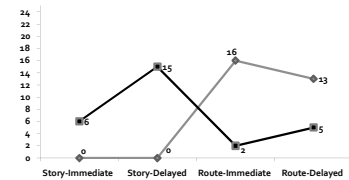
Data Analysis

The story and route recall tasks had different number of to-be-recalled elements. **Story Recall:** Story had 21 information units that had to be correctly recalled.

Route Recall: The route had 11 components which included participants having to remember 5 points on a route (e.g., from the chair to the window to the bookshelf to the door and back to the chair), an item to take along (envelope), and a location in the room to leave this item.

Participant raw scores were converted to a % recall score to allow direct comparison of story and route recall performance. Quantitative analysis was done using a non-parametric, chi-squared test to compare numbers of PWD who had zero scores (no recall) on story and route recall versus PWD who had perfect scores (100% recall).

Condition	# who scored 100%	# who scored 0%
Story-Immediate	0	6
Story-Delayed	0	15
Route-Immediate	16	2
Route-Delayed	13	5



Results

1. PWD demonstrated a striking double dissociation i.e., recalled routes significantly better than stories at immediate and delayed recall trials. Chi-squared analyses revealed a statistically significant difference ($\chi^2 = 15.121$, $p = 0.0017$) in route versus story recall.
2. This finding is impressive and validates that dementia impacts declarative memory more severely than nondeclarative memory.
3. Interestingly, two out of 25 PWD did not recall any point on the route at immediate recall. This variability in performance suggests the importance of obtaining objective indices of nondeclarative memory in PWD. Likely, in moderate dementia, ability to recall routes also begins to be impaired.

Clinical Implications

From an evidence-based perspective, our findings showcase the importance of assessing episodic/declarative and nondeclarative memory in PWD to document spared memory abilities and restorative potential.

Relatively spared route recall showcases the potential of PWD to enhance their performance when recall tasks are nondeclarative (e.g. performing a procedure or return demonstration of therapy strategy).