

Visual Memory and its Relationship to Reading Comprehension in Alzheimer's Patients

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Abstract:

Alzheimer's patients suffer from frequent forgetfulness, which later affects their language abilities. This can result in difficulty naming objects, expressing themselves, slurred speech, and comprehension issues. Consequently, these challenges impact the cognitive activity of patients, including understanding and memory.

The current study aims to examine the relationship between visual memory and reading comprehension in Alzheimer's patients. We operate on the assumption that cognitive processes contribute to effective performance and reactions. Therefore, our research highlights the importance of these processes in handling cognitive information, which serves as essential material for understanding and analyzing sensory information. Through these processes, individuals can recognize stimuli and sensory inputs, and cognitive activity declines in Alzheimer's patients.

To achieve our objectives, we applied several tests, including the Mini-Mental State Examination (MMSE), the Brief Mental State Examination, the Rey Simple Figure Visual Memory Test, and the MTA 2002 Test. Our sample consisted of eight Alzheimer's patients aged between 72 and 89. Alzheimer's is a neurodegenerative disease caused by atrophy in brain cells in regions responsible for higher functions, such as memory and concentration (language, comprehension, awareness, and knowledge). Our results indicate that visual memory significantly affects reading comprehension and has a profound impact on cognitive activities in Alzheimer's patients. Statistical analysis confirms that weak visual memory correlates with weak reading comprehension in this group of patients.

Keywords: Visual Memory, Reading Comprehension, Alzheimer's.

1. Introduction and Research Problem

Health is a vital asset for individuals, signifying well-being and vitality, and its value often goes unrecognized until it is compromised, particularly in old age. For seniors, cognitive health poses significant adaptation challenges, with issues worsening as the brain and nervous system deteriorate. The brain has long been a focal point of study due to its critical role in individual functioning. However, neurodegeneration — characterized by cortical atrophy and neuronal loss — can occur, leading to Alzheimer's disease, the most common form of dementia. Named after its discoverer Alois Alzheimer in 1906, Alzheimer's affects approximately two-thirds of dementia patients. Studies estimate that around 25% of the elderly suffer from serious brain diseases, with cognitive disorders like Alzheimer's being among the foremost.

This study seeks to address the following question:

Is there a relationship between visual memory and reading comprehension in Alzheimer's patients?

2. Hypothesis: Visual memory is associated with reading comprehension in Alzheimer's patients.

3. Importance of the Study

This study is significant because it focuses on a segment of the population affected by Alzheimer's disease, assessing how cognitive functions like visual memory and reading comprehension are impacted. Additionally, it highlights how Alzheimer's affects visual memory in recognizing written words. By examining Alzheimer's patients, this study aims to provide insight into the potential future impact of aging on individuals' lives and the consequences of this disease.

4. Study Objectives

- To understand the role of cognitive functions in the brain and their influence on visual memory and reading comprehension in Alzheimer's patients.
- To explore the relationship between visual memory and reading comprehension in Alzheimer's patients.
- To assess the impact of Alzheimer's disease on the cognitive activity of patients and its effects on their cognitive processes.

5. Definition of Key Terms

- **Visual Memory:** The ability to interpret information from environmental stimuli and distinguish various attributes such as shape, color, and size through a series of mental processes.
- **Reading Comprehension:** An interactive process enabling individuals to understand the vocabulary and words in a text, discerning the relationships among the various parts of the linguistic content.
- **Alzheimer's Disease:** A neurodegenerative disease of the central nervous system, manifesting as a gradual and continuous decline in mental abilities.

6. Literature Review

1. **Brooke et al. (1996):** This foreign study aimed to determine the timing of disruptions in executive functions in Alzheimer's patients by tracking patients who initially had mild cognitive impairment, comparing their cognitive evolution with that of healthy elderly individuals using neuropsychological tests.
2. **Ben Arab (2012):** This Arab study examined executive dysfunction in early-stage Alzheimer's patients, employing neuropsychological tests to evaluate general cognitive performance and executive function through frontal lobe assessment tools.
3. **Boushamha Basma (2008):** This research assessed visual memory in Alzheimer's patients through the DMS-48 Recognition Memory Test in Algerian clinical settings, confirming the role of visual memory in early diagnosis.
4. **Nadia Tayri (2014):** Investigating the relationship between visual perception difficulties and writing challenges in third-grade students, showing a connection between visual perception difficulties and learning writing skills.

5. **Khawla Falah (2014)**: Explored how neurological motor disabilities impact visual perception in children aged 10-13.
6. **Mansouria Boukhatem (2017)**: Examined the relationship between auditory-visual perception and reading comprehension among third-grade students.
7. **Nabil Lemouri (2018)**: Investigated the relationship between visual perception difficulties and reading comprehension among dyslexic French language students, confirming a strong connection between these areas.
8. **Royce and Bouzalim (2019)**: Studied the impact of Broca’s aphasia on visual perception and written comprehension.

7. Methodology

1. **Study Design**: This study used a clinical case study approach.
2. **Sample**: The sample consisted of eight Alzheimer’s patients aged 72-89.
3. **Study Instruments**:
 - o **MMSE**: To assess cognitive and neuropsychological conditions, mental abilities, and the severity of impairment.
 - o **Rey Figure Test**: Used to identify cognitive disruptions in Alzheimer’s patients.
 - o **MTA**: Provides individual scoring sheets; interviews and observations were also conducted.

8. Presentation and Discussion of Results

The study hypothesis suggests that visual memory is associated with reading comprehension in Alzheimer’s patients. The table presents results from the tests administered to the Alzheimer’s patients, showing a clear link between weak visual memory and poor reading comprehension.

The **MMSE, MTA, and Rey Figure Tests** revealed difficulties in orientation (time and place) and word recall, with patients struggling to identify the temporal and spatial context. They demonstrated challenges in retaining words, with memory fading shortly after initial recall.

In the **Rey Figure Test**, patients scored 11 out of 36 points, or 30.55%, showing significant difficulty in reproducing visual shapes and arranging elements correctly on the page, reflecting visual memory impairments.

Reading Comprehension Test: Patients initially struggled to comprehend written instructions, particularly as sentences grew in length and complexity. However, they managed to understand individual words within simpler sentences.

Table Analysis of Cognitive Tests in Alzheimer's Patients

Test	MTA Score	Rey Figure Score	MMSE (Mini-Mental State Examination)
Word Recall	5	3	0
Simple Word Recall	39/12	30/16	-
Sentence Recall	0	-	-

Percentage Scores:

- MTA (Word Recall): **70%**
- Simple Word Recall (Rey Figure): **35.37%**
- Sentence Recall: **0%**
- MMSE: **33.33%** for orientation, **55.53%** for spatial awareness

Explanation of Results:

1. MMSE (Mini-Mental State Examination):

- **Orientation:** Patients struggled significantly, with an overall orientation score of **0/5 (0%)**. Most patients failed to answer time-related questions and scored low on spatial awareness.
- **Memory Recall:** Patients had difficulty retaining words shortly after hearing them. They were able to recall only three words at the moment of testing.
- **Attention and Calculation:** Patients attempted basic calculations but only managed a score of **3 points**.
- **Language Comprehension:** While patients could provide some correct responses, they experienced delays and difficulty understanding instructions.

2. Rey Figure Test (Complex Figure of Rey):

- Patients achieved **11 out of 36 points (30.55%)**. They struggled to replicate shapes accurately, reflecting significant visual memory issues. Despite attempting the major elements (such as the large rectangle), other elements were either missing or inaccurately placed.

3. Reading Comprehension Test:

- **Initial Stage:** Patients could comprehend **3 out of 5 words (60%)** in a short time, showing difficulty as sentences became more complex.
- **Intermediate Stage:** Patients understood **1 out of 3 sentences (33.93%)** within 33.91 seconds, successfully interpreting simpler phrases while failing to grasp more complex content.
- **Advanced Stage:** Patients could not comprehend any sentences in the final stage (0%).

9. Discussion of Results

The findings confirm that weak reading comprehension correlates with visual memory deficiencies in Alzheimer's patients. These results align with previous studies, such as **Langer (1985)**, which also found a relationship between memory and reading comprehension.

Conclusion: Reading comprehension relies not only on decoding written symbols but also on interpreting, analyzing, and understanding them. The results underscore the critical impact of visual memory on reading comprehension, where impairment in any skill related to visual perception can adversely affect comprehension abilities.

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