Journal of Human Studies and Social . University Oran2. Vol: 14 .N : 02.
ISNN : 2253-0592 EISSN : 2588-199X / Prefix: 10.46315

Alzheimer's Disease and Mild Cognitive Impairment, DMS48 Visual Memory Comparative Results.

مرض الزهايمر والتدهور المعرفي المعتدل، دراسة مقارنة لأداء الذاكرة البصرية باستخدام رائز DMS48

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DOI : 10.46315/1714-014-002-063

Received: 01/ 01/ 2025 Accepted: 11/ 05/ 2025 Published: 16/ 06/ 2025

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Abstract (English):

Alzheimer's disease is known as a progressive neurological disorder that initially impacts memory, behavior and overall cognitive abilities; it is the widely most common cause of dementia, resulting from abnormal brain changes. While various factors can contribute to these changes, ageing is the most common cause. One of the first cognitive functions affected in early-stage Alzheimer's is episodic visual memory, which becomes noticeable in affected individuals. Aging also impacts cognitive abilities such as attention, perception, memory, and language, although not as severely as Alzheimer's disease. Mild Cognitive Impairment is a condition where individuals experience mild cognitive decline that exceeds what is expected for their age but is not severe enough to interfere with daily life. MCI typically involves memory, thinking, and judgment issues, but the changes are not significant enough to be classified as dementia. This study aims to differentiate between Alzheimer's disease and Mild Cognitive Impairment in terms of visual episodic memory using the DMS48.

Keywords: Alzheimer's disease, Mild cognitive impairment, DMS 48, Episodic memory, Dementia

ملخص باللغة العربية

الزهايمر هو اضطراب عصبي انحلالي يؤثر بشكل رئيسي على الذاكرة وهو السبب الأكثر شيوعًا للخرف ويحدث نتيجة لتغيرات في الدماغ. من أول الوظائف المعرفية المضطربة في مرحلة الزهايمر المبكرة هي الذاكرة البصرية العرضية، التي تصبح ملحوظة لدى المصابين من عائلاتهم كما تؤثر الشيخوخة أيضًا على القدرات المعرفية مثل الانتباه والإدراك واللغة ولكن ليس بنفس شدة تأثير الزهايمر، تُعرف هذه الحالة بالتدهور المعرفي المُعتدل أين يتجاوز التدهور المُتوقع لسنهم ولكنه ليس شديدًا بما يكفي للتداخل مع حياتهم. اعتمادا على ما سبق هدف هذه الدراسة هو التمييز بين مرض الزهايمر و الاضطراب المعرفي المعتدل من حيث الذاكرة البصرية العرضية باستخدام اختبار DMS48.

قمنا بتقييم مستوى الذاكرة البصرية العرضية لدى مرضى الزهايمر ثم مستوى الذاكرة البصرية العرضية لدى المصابين بالتدهور المعرفي المُعتدل باختبار DMS48 ثم احصينا النتائج في جداول مقارنة واستخلصنا الفرق بهدف توضيح التمايز الكمي في الاداء بين الفئتين الموضحتين خلال الدراسة والتمييز بينهما.

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نستعمل قيد الدراسة المنهج الوصفي المقارن اين نستعمل اختبار DMS48 لوصف مستوى الذاكرة البصرية العرضية عند مجموعتين ثم المقارنة بينهما كميا.

الفروقات بين مرضى الزهايمر والتدهور المعرفي المعتدل واضحة كميا من خلال تحليل النتائج، حتى ولو ان كل من المجموعتان يعانيان من تدهور محسوس على مستوى الذاكرة البصرية العرضية فان النتائج توحي باختلاف في الشدة ملحوظ عبر مقارنة نتائج الفحص للمراحل الثلاث من اختبار DMS48 على العينتين.

الكلمات المفتاحية :مرض ألزهايمر؛ الضعف الإدراكي البسيط؛ اختبار DMS 48 ؛ الذاكرة العرضية؛ الخرف

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1.Introduction

Cognitive abilities refer to the mental processes used to acquire, process, store, and apply information, enabling individuals to interact with and navigate their environment. These abilities include memory, attention, perception, reasoning, problem-solving, and language. Cognitive functions are dynamic, developing throughout life and influenced by genetic, environmental, and social factors. During early childhood, the brain experiences significant development, with rapid neural connection formation to support learning and basic cognitive functions. As people age, cognitive abilities become more refined, with the brain consolidating neural networks that enhance higher-order functions like abstract thinking, decision-making, and executive functions (Bradfield, 2023). Peak cognitive function typically occurs in early adulthood, where individuals exhibit strong cognitive performance, especially in areas like processing speed, working memory, and problem-solving. However, with aging, cognitive abilities change gradually. While certain functions, such as crystallized intelligence (knowledge gained through experience), remain stable or improve with age, others related to fluid intelligence (memory, processing speed, and reasoning) decline. This decline is part of natural aging and is linked to structural and functional brain changes, including reduced brain region volume, neuron loss, and decreased neural network efficiency (Bansal & al, 2014). The aging brain is also more susceptible to neurodegenerative diseases like Alzheimer's, which accelerate cognitive decline. In those affected by these conditions, cognitive decline can significantly impact daily functioning, memory, and emotional regulation. Even without these diseases, normal aging can alter cognitive abilities, affecting tasks, memory, and adaptability. Factors like genetics, lifestyle choices (physical activity, diet, mental stimulation), and the environment play a critical role in shaping cognitive aging and determining the extent of decline (Breijyeh & Karaman, 2020). Understanding cognitive development and decline is essential for advancing scientific knowledge and for creating strategies to support healthy aging. These strategies include interventions like cognitive training, physical exercise, and social engagement. Recognizing early signs of cognitive impairment is also vital for diagnosing and managing age-related cognitive disorders, improving quality of life, and helping individuals maintain independence as long as possible. The interaction between normal aging and pathological cognitive decline remains a key area of research, offering potential to improve interventions and outcomes for aging populations worldwide (Jongsiriyanyong & Limpawattana, 2018). Dementia is known to significantly cause decline in mental abilities such as memory, reasoning, and thought processes. It is not a single disease but a clinical term covering cognitive impairments resulting from various conditions, with Alzheimer's being the most well-known. Alzheimer's is a progressive neurological disorder affecting memory, thinking, daily tasks, and behavior, due to abnormal brain changes like beta-amyloid plaque accumulation

and tau protein buildup, leading to widespread neuron loss and disrupted synaptic connections. Alzheimer's is often confused with normal aging or other forms of dementia, though each is distinct. Normal aging involves gradual physical changes, such as hair thinning and minor memory lapses. In contrast, severe memory loss and cognitive decline that interfere with daily life are not part of natural aging. In cases where cognitive decline is not severe enough to qualify as dementia, the condition is categorized as mild cognitive impairment (MCI). MCI is of particular concern due to its association with an increased risk of progression to dementia, especially Alzheimer's disease.

2. Problematic

Both mild cognitive impairment and Alzheimer's disease affect cognitive abilities in old age, leading to a decline in life quality, particularly in performance and interactive efficiency. The challenge is distinguishing between these conditions using functional neuropsychological screening tests without relying solely on MRI or CT scans. If individuals with Alzheimer's and MCI exhibit similar symptoms and share overlapping areas of dysfunction, how can we effectively differentiate between these pathologies using functional neuropsychological screening tests?

3. Objectives

The study has objectives as follows:

Demonstrate that both Alzheimer's disease and mild cognitive impairment (MCI) are associated with cognitive decline using the DMS-48 screening test.

Differentiate the results obtained from the DMS-48 screening test for both categories.

Restrict each pathological category according to the degree of episodic memory impairment.

Facilitate the distinction between the two pathologies based on DMS-48 screening test results.

Study sample:

Following this study and its goals, we divided our sample groups into two categories: 25 elders newly diagnosed with early-stage Alzheimer's disease between the ages of 65 and 75 and 25 elders between the ages of 65 and 75 who have cognitive difficulties in memory but do not show clinical neurological physical symptoms of Alzheimer's disease. Each group had 13 males and 12 females, as follows in the table below.

All the 50 individuals below in the study group have no educational or academic background.

Table (1): Repartition of patients in the study and their diagnostic

	Alzheimer's	MCI	Age
Male	13	13	65-75
Female	12	12	65-75

4. Methods

for this study, we decided to conduct a study using a visual episodic memory screening tool, the DMS48, designed especially to detect early Alzheimer's disease signs by evaluating functionally the episodic visual memory; the study aims to apply the test on two different groups, the first group diagnosed with Alzheimer's

disease patients on early stage, and the second group on people on the same age presenting mild cognitive impairment and deducting correlation between the results after applying the DMS 48.

5.Methodology

In this study, we employed an inductive methodology, wherein observations were gathered to form broader generalizations, theories, or principles. This approach progresses from specific data points to more generalized conclusions., which can contribute to theory development. In our study, we are gathering information on episodic visual memory in individuals with mild cognitive impairment and Alzheimer's disease, focusing on the decline observed at the cognitive level. We are utilizing a neuropsychological screening tool (DMS-48) to assess this decline and compare the results between the two samples.

6.Study Tools

DMS 48

The DMS 48 is a Visual recognition memory test developed for the early diagnosis of Alzheimer's disease, normative scores for this tool were made using data from the AMI cohort (Integrated Multidisciplinary Approach). The normative sub-sample included 750 non-demented elderly individuals, while the validity study sub-sample consisted of 751 individuals, including 34 with Alzheimer's, the normative scores were established based on age, gender, and education level. Regarding validity, the DMS 48 showed a good balance between sensitivity (Se) and specificity (Sp) for both immediate recall (Se = 70.6%; Sp = 79.6%) and delayed recall (Se = 79.4%; Sp = 72.9%). It also demonstrated high negative predictive values, around 98.5% for both recall tests, it is a simple tool to use in clinical practice and could be valuable in the diagnostic process for Alzheimer's disease.

(Barbeau & Al, 2004,)

Description of the DMS 48

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Assessing the DMS 48

The encoding phase is performed under incidental conditions: The examiner presents the images individually to the subject, who is instructed to indicate whether each image contains more or fewer than three colors. This instruction ensures that the subject processes the morphological properties of the stimuli

during the acquisition phase. This acquisition phase is followed by an interference task of approximately three minutes, usually a verbal fluency task.

In the first test phase, the examiner presents image pairs to the subject, who must recognize the target.

The second test phase occurs using set 2, following the same forced-choice recognition procedure as in phase after a one-hour delay during which various questionnaires collecting social and medical data are administered.

The third optional set allows for recall after a long period: 24 hours or one week.

DMS 48 Accuracy and psychometrics

All statistical data was analyzed using SAS software, version 9.3, to ensure robust and standardized data processing. to assess the effects of age, gender, and education level on the DMS 48 test through a mean comparison (Student's t-test). The study population was stratified according to age (65-74 years vs. 75+ years), gender, and education level (primary school certificate [CEP] not completed vs. CEP completed or higher education). For norming the DMS 48's immediate and one-hour recognition phases, percentiles were used to divide the score distribution into 100 equal parts, with the 5th and 75th percentiles calculated for each phase based on age, gender, and education level. Percentiles are particularly suitable for data that does not follow a normal distribution, which is typical in cognitive test scores, and allow clinicians to compare a patient's performance against that of a normative group. The DMS 48's diagnostic accuracy in detecting Alzheimer's disease (AD) was evaluated by calculating specificity, sensitivity and positive predictive value (PPV) and also the negative predictive value (NPV). Sensitivity indicates the likelihood of a positive test result in individuals with the disease, while specificity measures the likelihood of a negative result in healthy individuals. PPV reflects the probability of having AD when the test is positive, and NPV indicates the likelihood of not having AD when the test is negative. The Youden Index was computed to set the max cutoff score those best balances sensitivity and specificity. which evaluates the test's predictive accuracy across all possible thresholds. The ROC curve summarizes the test's overall performance, with values ranging from 1 (perfect prediction) to 0.5 (random prediction), representing the likelihood that an AD patient will have a lower cognitive score than a healthy individual. This comprehensive statistical evaluation provides valuable insights into the DMS 48's diagnostic capability, enabling its potential use in clinical practice for detecting Alzheimer's disease and assisting in early diagnosis.

7.Dementia

Dementia is a decline in cognitive functioning, causing impairment that interferes with autonomy in daily activities. It is perceived as a neurodegenerative disorder characterized by a progressive and continuous loss and weakening of cognitive functions. The neuropsychiatric symptoms may include agitation, depression and apathy in some cases. As the disorder progresses, the patient slowly becomes dependent on others to perform simple daily activities. Tasks, Specific signs and symptoms, combined with presumed underlying neuropathology, characterize each disorder or disease (Kumar al, 2024, pp. 1-3) Beyond cognitive decline, it also influences emotional regulation, behaviour, and interpersonal relationships. Among the many forms of dementia, Alzheimer's is the most prevalent, representing approximately 60–80% of all diagnosed cases.

Vascular dementia, typically resulting from microvascular damage such as cerebral bleeding or blockage of small blood vessels, represents the second most common aetiology. Moreover, some individuals may exhibit neuropathological features associated with more than one type of dementia, a condition referred to as mixed dementia. Many other conditions can cause symptoms of cognitive impairment that are not dementia, including reversible ones, such as thyroid problems and avitaminosis deficiencies. (Chang Wong & Al, 2022,2)

8.Alzheimer's disease

Alzheimer's disease (AD), first identified in 1906 by Alois Alzheimer in a 51-year-old woman, Auguste D, was characterized by changes in personality, behavior, memory, and language. Dr. Alzheimer observed symptoms of dementia, including aggression, confusion, and memory loss, later conducting an autopsy that revealed significant shrinkage of the cerebral cortex, lipid deposits, neuronal atrophy, neurofibrillary tangles, and senile plaques—pathological features now recognized as key markers of AD. The condition was formally named "Alzheimer's disease" in 1910 (What is dementia, 2024). AD is the most common type of dementia in individuals over 65, marked by a progressive decline in cognitive functions like memory, language, and behavior. It is multifactorial, with genetic factors, age, vascular diseases, head injuries, infections, and environmental influences playing roles in its development (Villanueva & Al, 2022; Anand & Schoo, 2024).

Neurological Effects: AD progression is marked by the development of two main pathological features: **senile plaques** and **neurofibrillary tangles**. Plaques, formed by beta-amyloid peptides, appear in the neocortex and hippocampus, while tangles of tau protein form later in the trans-entorhinal region and spread throughout the brain. These two pathologies follow distinct patterns and appear at different stages, with the overlap of both amyloid and tau pathologies being characteristic of advanced AD (Jahn, 2013).

Risk Factors: The most significant risk factor for AD is age. Approximately 5% of people aged 65-74 develop the disease, with the risk rising to 50% for those over 85. **Genetics** plays a role in AD, with the **Apolipoprotein E (ApoE)** gene influencing disease onset. The **ApoE4 allele** increases AD risk, while **ApoE2** offers protection. **Familial AD**, a rare form of early-onset AD, is linked to mutations in chromosomes 1, 14, and 21, affecting less than 10% of cases. Inherited mutations confer a 50% risk to offspring (Marina Avila & Al, 2022).

Memory Loss: The earliest symptom of AD is memory loss, particularly affecting working and long-term declarative memory. AD disrupts memory formation at both the molecular and neural network levels, influencing brain regions such as the default mode network. Genetic factors, such as the ApoE4 allele, contribute to this impairment. Evaluating memory is essential for diagnosing AD, determining subtypes, and predicting disease progression. While biomarkers from cerebrospinal

fluid and hippocampal volume measurements aid early detection, neuropsychological testing remains fundamental for diagnosis (Jahn, 2013).

9.Mild cognitive impairment

Mild cognitive impairment is a clinical diagnosis characterized by noticeable, objectively measurable cognitive decline but does not significantly impact daily functioning. Diagnosis typically involves a clinical interview, gathering information from an informant, and psychometric tests. Different consensus groups have established criteria for MCI in various conditions, such as Alzheimer's disease, dementia with Lewy bodies, and vascular cognitive impairment. These criteria have important but subtle differences, particularly in how subjective cognitive decline is defined, whether it pertains to memory loss or any other cognitive domain and who notices the decline (the patient, a caregiver, or a clinician). There are also varying thresholds for objective cognitive impairment across diagnostic criteria and differing views on the impact of functional abilities. Once diagnosed, MCI can be further categorized into one of four subtypes based on the pattern of cognitive impairments, including whether memory is involved and other cognitive domains are affected. After a diagnosis of MCI, patients and their families should receive guidance on the social and legal consequences of the condition and strategies to prevent further cognitive decline. In 2013, the American Psychiatry Association's DSM-V classified Mild Cognitive Impairment (MCI) as a type of neurocognitive disorder (NCD). MCI is marked by a decline in one or more cognitive domains that is noticeable both subjectively and objectively. However, this decline does not impact the individual's ability to carry out daily activities independently. Additionally, the cognitive deficits cannot be explained by delirium or other psychiatric disorders. (Bradfield, 2023, 4-11)

10. Previous Studies

1. Mild cognitive impairment as a diagnostic entity

Mild Cognitive Impairment (MCI) is recognized as an early stage of cognitive decline, bridging normal aging and dementia, with significant research focused on its role in Alzheimer's Disease (AD). As discussed by R.C. Peterson, AD diagnosis can only be confirmed post-mortem through neuropathological examination, but clinical-pathological correlations are strong when standardized diagnostic criteria are used. MCI identifies individuals with subtle cognitive changes, offering a potential window for early intervention. Studies, such as those at the Mayo Alzheimer's Disease Research Center, show that individuals with MCI have a higher risk of progressing to dementia. In a cohort of 220 individuals, aged 79 on average, followed for 3–6 years, 12% per year progressed to dementia, compared to 1–2% in the general population. After 6 years, 80% of those with MCI had progressed to dementia. Studies from Toronto, Seattle, New York University, and Harvard further support this risk. For instance, Toronto-based research identified memory tests as predictors, while Seattle's study showed that nearly 50% of MCI patients progressed to dementia over 5 years. Despite some inconsistencies, such as findings from France suggesting MCI instability, the overall consensus indicates that MCI is a key risk factor for dementia. Research has also highlighted factors predicting faster progression to dementia, including Apolipoprotein

E4 (ApoE4) allele status and abnormal memory task performance. These findings underscore the importance of refining MCI diagnostic criteria and understanding individual risk factors for earlier diagnosis and treatment. Peterson concludes that MCI research, though variable due to methodological differences, remains critical for identifying individuals at high risk for dementia, and calls for further studies to refine neuropsychological measures and evaluate progression across diverse populations (Peterson R.C., 2004).

2. Episodic Memory Impairment in Alzheimer's Disease: Recollection and Familiarity Deficits

Jessica Simon and Christine Bastin investigated episodic memory impairment in Alzheimer's disease (AD), focusing on the decline in recollection and the status of familiarity. The study aimed to determine whether familiarity remains intact in early AD stages or is impaired alongside recollection. The authors used methods like the Remember/Know (R/K) paradigm, Receiver Operating Characteristic (ROC) analysis, Process Dissociation Procedure (PDP), and forced-choice recognition tasks to assess recognition memory in individuals with Alzheimer's disease, amnestic mild cognitive impairment (aMCI), and healthy controls. Using verbal words, pictures, and associative pairs, they measured the extent of impairment in recollection and familiarity processes. The results showed that recollection is significantly impaired in both aMCI and AD patients, confirming hippocampal dysfunction's role in early AD pathology. However, the findings on familiarity were mixed. Some tasks, particularly forced-choice recognition, suggested relative preservation, while others pointed to early impairment depending on task demands. These inconsistencies suggest that familiarity is a complex cognitive function, potentially underpinned by distinct neural mechanisms. The study emphasizes the need for standardized methods in assessing memory deficits in AD, contributing to ongoing debates on the differential impact of neurodegeneration on memory processes and highlighting the importance of refining cognitive assessments for early AD detection (Simon & Bastin, 2014).

3. Episodic Memory Performance and Alzheimer's Disease Biomarkers: A Longitudinal Study.

Geoffroy Gagliardi and colleagues conducted a longitudinal study to explore the relationship between episodic memory (EM) performance and Alzheimer's disease (AD) biomarkers in elderly individuals with subjective cognitive complaints. The study followed 318 cognitively healthy participants over two years, assessing their performance on four episodic memory tests and baseline brain amyloid load and metabolism. Generalized linear mixed models were used to analyze the longitudinal effects of these biomarkers on memory performance. The results showed that increased brain amyloid deposition was linked to poorer performance on the Memory Binding Test (MBT) and Delayed Matched Sample (DMS-48) test, but no direct link was found between memory performance and brain metabolism. Additionally, the interaction between amyloid burden and metabolism correlated with more intrusions in the MBT over the two-year period. These findings suggest that challenging episodic memory tasks and intrusion

errors may serve as potential markers for detecting the transition from preclinical to prodromal AD. This study underscores the need for refining cognitive assessments as clinical trials focus on early-stage AD, aiming to improve early diagnosis and intervention strategies (Gagliardi et al., 2019).

4. Screening for Cognitive Impairment in Older Adults: Evidence Update for the U.S. Preventive Services Task Force

This systematic review was conducted to assist the U.S. Preventive Services Task Force (USPSTF) in updating its 2014 recommendation on screening for cognitive impairment in older adults. The review aimed to assess the benefits and harms of cognitive impairment screening, evaluate the accuracy of screening tools for detecting mild cognitive impairment (MCI) and dementia, and examine the effectiveness of treatments for MCI and mild to moderate dementia in adults aged 65 and older. The updated search covered MEDLINE, PubMed, PsycINFO, and the Cochrane Central Register of Controlled Trials through January 2019. Two researchers reviewed 11,644 titles and 966 full-text articles based on prespecified criteria. Studies included those evaluating the accuracy of screening tools for primary care settings and trials of interventions for MCI or mild to moderate dementia. Data were synthesized for key questions, focusing on diagnostic accuracy. Meta-analyses were performed for the Mini Mental State Examination (MMSE), FDA-approved medications for Alzheimer's, nonpharmacologic interventions, and caregiver support interventions. Random-effects models and sensitivity analyses were used to assess variability. Screening: Only one trial directly evaluated the effects of cognitive impairment screening on outcomes, finding no significant differences in health-related quality of life, depression, anxiety, or healthcare utilization. The MMSE showed 89% sensitivity and specificity for dementia detection. Other screening instruments performed well, particularly those that were brief and self-administered. Screening tests were more accurate for dementia than for MCI, though overlap in confidence intervals was noted. No studies addressed the psychological effects or consequences of false positives/negatives. A total of 224 trials and 3 observational studies were included. Acetylcholinesterase inhibitors (AChEIs) and memantine showed modest improvements in cognitive function, but adverse events were more frequent with AChEIs. Other medications like statins and anti-inflammatory drugs had no cognitive benefits. Nonpharmacologic interventions showed limited improvements, with exercise providing small benefits in physical function. Caregiver interventions modestly improved burden and depression. Several brief screening tools effectively detect cognitive impairment, especially in higher dementia prevalence populations. However, there was no evidence that screening or early diagnosis improved outcomes or caused harm. Medications and caregiver support interventions showed small, short-term benefits, but these effects were not clinically significant. Screening and treatment evidence for MCI was limited, and few effective interventions for improving MCI outcomes were identified (Patnode, 2020).

5. Longitudinal Evolution of Autobiographical Memory in Mild Cognitive Impairment and Alzheimer's Disease

This study investigated the progression of autobiographical memory (both episodic and semantic) in individuals with mild cognitive impairment (MCI) and Alzheimer's disease (AD), compared to a healthy control group. Researchers assessed these groups at baseline and again after 18 months to identify changes. The study included 26 cognitively healthy older adults, 17 individuals with mild amnestic cognitive impairment (aMCI), and 16 AD patients, all matched for age and education. Results showed significant decline in both episodic and semantic autobiographical memory in MCI and AD individuals, with no such deterioration in healthy controls. While episodic memory impairment was evident in aMCI patients at baseline, semantic autobiographical memory exhibited a progressive decline over 18 months. These findings suggest that both memory types are compromised in AD, whereas in aMCI, semantic autobiographical memory initially remains relatively intact before deteriorating over time (Meléndez JC & Al, 2021).

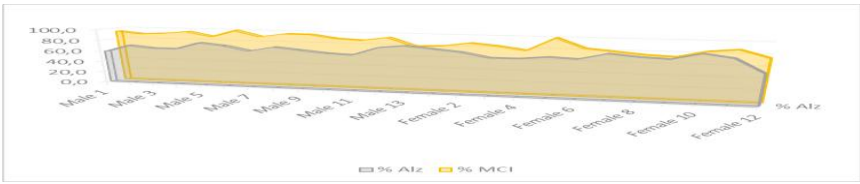
11. Results

Table (2): Results after assessing DMS48tet to the study groups and their results (P1-P3)

Alzheimer's disease	SET 1	SET 2	SET 3	MCI	SET 1	SET 2	SET 3	Alzheimer's disease	SET 1	SET 2	SET 3	MCI	SET 1	SET 2	SET 3
Male 1	28	26	13	Male 1	45	43	28	Female 1	38	36	23	Female 1	39	32	28
Male 2	34	35	25	Male 2	43	43	32	Female 2	36	35	26	Female 2	42	41	32
Male 3	32	30	24	Male 3	44	42	32	Female 3	32	34	28	Female 3	40	29	28
Male 4	32	28	18	Male 4	46	43	24	Female 4	32	24	22	Female 4	37	35	30
Male 5	38	36	24	Male 5	42	41	36	Female 5	34	28	18	Female 5	48	42	40
Male 6	36	36	23	Male 6	48	45	38	Female 6	33	26	16	Female 6	40	40	35
Male 7	32	28	22	Male 7	43	42	35	Female 7	38	32	18	Female 7	38	36	32
Male 8	36	38	25	Male 8	46	40	38	Female 8	36	33	22	Female 8	36	28	24
Male 9	34	33	26	Male 9	46	41	40	Female 9	35	31	21	Female 9	35	34	32
Male 10	32	30	28	Male 10	43	38	36	Female 10	40	32	31	Female 10	40	35	31
Male 11	31	36	22	Male 11	42	40	36	Female 11	37	28	26	Female 11	42	32	30
Male 12	38	32	24	Male 12	45	39	35	Female 12	26	26	24	Female 12	36	36	34
Male 13	40	42	28	Male 13	38	35	32								

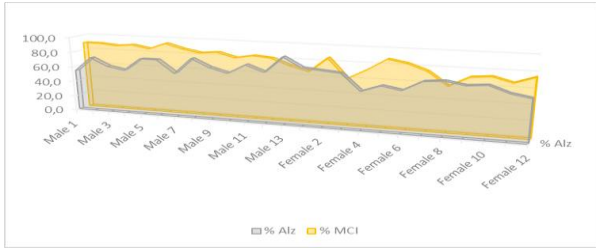
This table exhibits results after assessing DMS48 test both in Male and Female participants in SET1, SET2 and SET3, accordingly, as mentioned on the study sample, 13 Males and 12 Females in both groups, Alzheimer's and Mild cognitive impairment.

Fig (1): Exhibition of the results of set 1 comparing Alzheimer's disease in light gray and Mild cognitive impairment in light yellow.



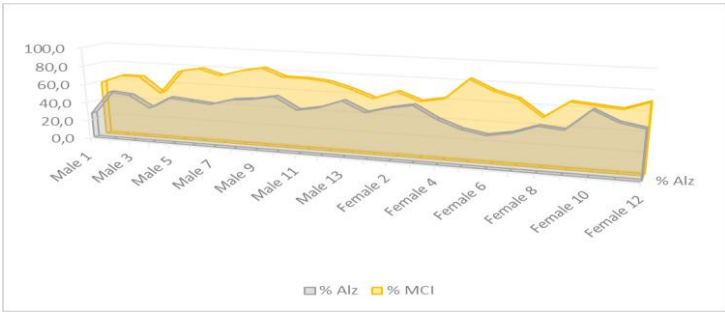
The figure presents results obtained from samples of individuals diagnosed with Alzheimer's Disease (AD) and Mild Cognitive Impairment (MCI), consisting of 13 males and 12 females. The Alzheimer's group is represented by a light gray color, while the MCI group is depicted in light yellow, the performance of the MCI group is set at an average of 87% of the DMS48 in Set1 whereas the Alzheimer's group's performance in set 1 is set at an average of 71.66%.

Fig (2): Exhibition of the results of set 2 comparing Alzheimer's disease in light gray and Mild cognitive impairment in light yellow.



The figure illustrates results from samples of individuals diagnosed with Alzheimer's Disease (AD) and Mild Cognitive Impairment (MCI), comprising 13 males and 12 females. The Alzheimer's group is represented in light gray, while the MCI group is depicted in light yellow. The MCI group exhibited an average performance of 79.33% on Set 2 of the DMS48, whereas the Alzheimer's group demonstrated an average performance of 66.25% on the same set.

Fig (3): Exhibition of the results of set 3 comparing Alzheimer's disease in light gray and Mild cognitive impairment in light yellow.



The figure presents results from samples of individuals diagnosed with Alzheimer's Disease (AD) and Mild Cognitive Impairment (MCI), including 13 males and 12 females. The Alzheimer's group is represented in light gray, while the MCI group is shown in light yellow. The MCI group demonstrated an average performance of 68.16% on Set 3 of the DMS48, whereas the Alzheimer's group exhibited an average performance of 48.08% on the same set.

12. Discussion

After analyzing the results gathered after completing the assessment of the DMS48 test, we can say that even though the fields of impairment in Alzheimer's disease and Mild cognitive impairment are similar to those in Episodic visual memory, the results show a difference in the performance between the two groups, with no difference between sexes in the same study groups.

Both study groups lost performance from set1 to set2 to set3

- The loss of performance of the Alzheimer's group is at 5.41% from set1 to set2
- The loss of performance of the Alzheimer's group is at 18.17% from set to set (7 days later)
- The loss of performance of the MCI group is at 7.67% from set 1 to set 2
- The loss of performance of the MCI group is at 11.17% from set 2 to set 3 (7 days later)

13. Conclusion

The screening results indicate that both groups experienced a decline in performance across different phases of the DMS48. However, the decline in the Alzheimer's group was more pronounced and severe compared to the MCI group. This distinction is clinically significant, as the symptoms of MCI are generally less severe than those seen in Alzheimer's disease or dementia. As noted by Peterson (2004), "MCI remains a critical area of study, offering insight into individuals at high risk of developing dementia." Consequently, Mild Cognitive Impairment (MCI) is often considered a transitional stage between regular age-related cognitive changes and early-stage dementia (Peterson, 2004). It is increasingly known as a risk factor for Alzheimer's Disease (AD) (What-Mild-Cognitive-Impairment, 2021).

The results further demonstrate that the DMS48 tool effectively captures the decline associated with Alzheimer's disease, consistent with the findings of a longitudinal observational study conducted by Geoffroy Gagliardi and colleagues (2019). In their study, Gagliardi et al. used the DMS48 to explore the relationship between episodic memory (EM) performance and Alzheimer's Disease (AD) biomarkers in elderly individuals reporting subjective cognitive complaints. Since AD pathology often develops years before clinical symptoms emerge, identifying the most sensitive episodic memory measures for early detection remains a critical challenge (Gagliardi et al., 2019).

These findings may be the foundation for a larger-scale study in Algeria, utilizing hospitals and elderly care centers as research sites. By applying the DMS48 tool, such a study could provide valuable insights into patients' future trajectory, identifying early markers of Alzheimer's disease or Mild Cognitive Impairment. Additionally, the study could explore when cognitive decline begins and at what age individuals should begin regular testing to prevent potential complications.

15. Recommendations

Future research should focus on applying the DMS 48 tool to differentiate between Mild Cognitive Impairment (MCI) and Alzheimer's Disease (AD) and explore its potential as a supportive diagnostic measure in clinical settings. With additional studies on the tool's effectiveness, it may provide a cost-

effective and reliable screening alternative, especially when compared to more expensive diagnostic methods such as MRI and other physical examinations. This is particularly pertinent when working with elderly populations, who often face economic challenges that limit access to higher-cost diagnostic options.

Standardizing the DMS 48 tool as a first-line screening could offer a practical solution, enabling healthcare providers to identify potential cognitive impairments early and directing patients to further testing only when necessary. Such an approach could significantly reduce the financial burden on patients and healthcare systems while enhancing diagnostic accuracy. Further investigation into the tool's diagnostic validity and applicability across diverse demographic groups is essential to establish its role in improving early detection and care for individuals at risk of dementia.

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