

Assessing Oral comprehension in Alzheimer's patients In the Algerian clinical field using Khomsi's O52 screening Tool

تقييم الفهم الشفهي عند المصابين بمرض الزهايمر في الوسط العيادي الجزائري باستخدام رائر O52
لخمسي

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Abstract:

This study aims to evaluate the effectiveness of the O52 test in assessing oral comprehension abilities in elderly individuals diagnosed with Alzheimer's disease, specifically within the age range of 75 to 85 years. A clinical sample of eight patients was evaluated using the O52 oral comprehension test, focusing on their capacity to understand spoken language in a structured, contextually relevant framework. The findings revealed a significant decline in oral comprehension abilities among the participants, consistent with the known cognitive deterioration characteristic of Alzheimer's progression. Notably, the comprehension deficits were more prominent in complex verbal instructions and syntactic structures, while basic word recognition remained relatively preserved in some cases. These observations align with previous literature indicating the early involvement of language-processing brain regions, particularly in the temporal and parietal lobes, in the neuropathology of Alzheimer's disease. The results underscore the importance of using targeted linguistic assessments—beyond general cognitive screening tools—to capture the specific nature of language decline in Alzheimer's patients. The study also highlights the practical relevance of the O52 test as a potentially valuable instrument in clinical speech-language evaluations, especially in Arabic-speaking elderly populations

Keywords: Alzheimer's disease, oral comprehension, elderly patients, language assessment, O52 test.

ملخص:

تهدف هذه الدراسة إلى تقييم فعالية اختبار O52 في قياس قدرات الفهم الشفهي لدى كبار السن المصابين بمرض الزهايمر، الذين تتراوح أعمارهم بين 75 و 85 عامًا. تم تقييم عينة مكونة من ثمانية مرضى باستخدام اختبار O52 ،

مع التركيز على قدرتهم على فهم اللغة المنطوقة ضمن إطار عمل منظم يتماشى مع السياق السريري. أظهرت النتائج تراجعاً ملحوظاً في قدرات الفهم الشفهي لدى المشاركين، بما يتفق مع التدهور المعرفي المعروف والمتوافق مع تقدم مرض الزهايمر. على وجه الخصوص، كانت العيوب في الفهم أكثر وضوحاً عند مواجهة تعليمات شفوية معقدة وتركيبات نحوية معقدة، بينما بقيت القدرة على التعرف على الكلمات الأساسية محفوظة نسبياً في بعض الحالات. تؤكد النتائج على أهمية استخدام تقييمات لغوية مستهدفة تتجاوز الأدوات التقليدية للمسح المعرفي العام، من أجل التقاط طبيعة التدهور اللغوي لدى مرضى الزهايمر. كما تبرز الدراسة الفعالية المحتملة لاختبار O52 كأداة هامة في التقييمات السريرية لاضطرابات اللغة، خاصة لدى كبار السن الناطقين بالعربية.

كلمات مفتاحية: مرض الزهايمر، الفهم الشفهي، الأشخاص المسنين، تقييم اللغة الشفهية، اختبار O52

1. Introduction

Alzheimer's disease (AD) is the most prevalent form of dementia and a major public health challenge, especially among the elderly. It is characterized by progressive neurodegeneration affecting memory, executive functions, and language (Alzheimer's Association, 2023). While memory loss is often the first noticeable symptom, impairments in oral language comprehension emerge early and worsen over time, significantly hindering communication and autonomy (Taler & Phillips, 2008).

Oral comprehension difficulties in AD extend beyond mere memory failure, involving disruptions in attention, syntactic parsing, and semantic integration (Sajjadi et al., 2012). These deficits reduce patients' ability to follow verbal instructions, often compromising safety and clinical care (Choi, 2019). Despite their impact, such impairments are rarely assessed with sufficient detail in standard cognitive screenings like the MMSE or MoCA, which overlook subtle linguistic breakdowns (Benke et al., 2017).

Neurolinguistic studies have shown that degeneration in the left temporal and parietal cortices—regions critical for processing spoken language—underlies many of these comprehension deficits (Frings et al., 2015). Patients may retain recognition of simple words but fail to understand complex or syntactically demanding speech (Croot et al., 2000). These challenges are further shaped by sociolinguistic context: standardized language tests often fail to reflect the linguistic realities of non-Western populations, such as Arabic speakers in Algeria (Fekih-Romdhane et al., 2021). This study investigates oral comprehension among Algerian patients aged 75–85 with Alzheimer's disease, using the O52 test—an ecologically valid tool suited for francophone and Arabic-speaking populations. The objective is to describe comprehension profiles and examine their relationship to known linguistic impairments in AD. In parallel, results from the DMS-48 memory test (Barbeau et al., 2004) are considered to explore potential links between visual memory and comprehension performance. By addressing this gap, the study contributes to more contextually appropriate diagnostic and intervention strategies in speech-language pathology and geriatric

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neuropsychology.

2. Problematic

Oral comprehension is one of the most vulnerable linguistic faculties in individuals with Alzheimer's disease. Numerous studies have shown that as the disease progresses, patients increasingly struggle to decode spoken messages, particularly those involving syntactic complexity, abstract concepts, or multi-step instructions. This deterioration is closely linked to the neurodegenerative processes affecting regions of the brain responsible for language processing, working memory, and attentional control.

Despite its clinical importance, oral comprehension remains underassessed in standard cognitive evaluation batteries, which tend to focus more heavily on memory, visuospatial skills, and general orientation. Furthermore, in many clinical settings especially in developing countries or under-resourced healthcare systems language assessments are often limited to basic naming or repetition tasks, which do not capture the intricacies of comprehension decline.

In the Algerian clinical context, this gap is even more pronounced due to the scarcity of culturally and linguistically adapted assessment tools. The limited availability of standardized oral comprehension tests especially those normed for elderly populations poses a significant barrier to accurate diagnosis and effective intervention planning.

The O52 test, although not widely documented in international literature, is used in some clinical contexts as a screening tool for oral comprehension. However, there is a lack of empirical studies evaluating its effectiveness, sensitivity, or psychometric validity specifically in Alzheimer's disease populations. This raises important questions: Can the O52 test reliably detect early and moderate oral comprehension deficits in elderly Alzheimer's patients? How do the results correlate with known patterns of cognitive decline? And can such a tool be feasibly integrated into routine diagnostic protocols in Algerian clinical practice?

3. Objectives

This study aims to evaluate the effectiveness of the O52 test as a tool for measuring oral comprehension in patients with moderate-stage Alzheimer's disease, aged between 75 and 85 years. It also seeks to identify the relationship between the deterioration of linguistic abilities and oral comprehension in Alzheimer's disease, with a focus on analyzing differences between patients in their ability to understand complex verbal instructions. Additionally, the study aims to examine the feasibility of using the O52 test as an additional diagnostic tool in assessing language disorders in elderly individuals with Alzheimer's disease. Through its results, the study seeks to provide new insights into the importance of early detection of oral comprehension deficits in Alzheimer's disease, with the goal of improving therapeutic

4. Study Sample:

The study involved eight elderly patients (aged 75–85) diagnosed with moderate-stage Alzheimer's disease, based on DSM-5 and NINCDS-ADRDA criteria. Recruited from dementia-focused outpatient clinics, all participants were screened to exclude other neurological or psychiatric conditions. The sample reflected varied levels of cognitive decline, enabling a broader analysis of oral comprehension. Patients were matched for gender and socio-economic background, and informed consent was obtained from each participant or their legal representative.

5. Methods

This study employed a quantitative, cross-sectional design to assess the oral comprehension abilities of elderly patients with moderate-stage Alzheimer's disease. Data were collected using a combination of clinical assessments and standardized language testing tools. The primary method for evaluating oral comprehension was the O52 test, which was selected for its reliability and validity in assessing language comprehension abilities in patients with cognitive impairments, including Alzheimer's disease.

The O52 test was administered individually to each participant in a quiet, controlled clinical environment to minimize external distractions. The test consisted of several subtests that required participants to listen to spoken instructions and then respond either verbally or by pointing to corresponding images or objects. These instructions ranged from simple commands to more complex, multi-step directions, enabling a detailed assessment of the participants' ability to comprehend spoken language of varying complexity.

In addition to the O52 test, cognitive functioning was evaluated using the DMS-48 (Memory Screening Test), which provided a broader picture of the cognitive status of the participants, including their memory and attention abilities. This allowed for a correlation analysis between overall cognitive decline and oral comprehension performance.

Data collection was conducted over a period of two months, and the testing was performed by trained neuropsychologists and speech-language pathologists. To ensure consistency and reliability, all test administrators followed the same protocol and guidelines for conducting the assessments.

6. Methodology

The methodology for this study follows a mixed-methods approach, combining both quantitative and qualitative data to assess the oral comprehension abilities of elderly patients diagnosed with Alzheimer's disease. The core of the methodology revolves around the use of the O52 test as a primary tool for evaluating language comprehension, supplemented by additional cognitive assessments and clinical observations to provide a comprehensive

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understanding of the participants' cognitive and communicative abilities.

6.1 Quantitative Assessment

The O52 test, a standardized language comprehension tool, was used to quantitatively measure the participants' ability to comprehend oral language in various forms. The test involves both basic and complex verbal instructions, requiring participants to demonstrate their understanding by responding verbally or by selecting corresponding images or objects. Each participant's score was recorded and analyzed based on their performance in both simple and complex tasks. This allowed for an evaluation of the severity of oral comprehension deficits in relation to the progression of Alzheimer's disease.

Additionally, cognitive function was assessed using the DMS-48 (Memory Screening Test), which includes a series of tasks designed to measure memory and cognitive processing abilities. The DMS-48 provided data on the participants' general cognitive status and enabled the comparison of oral comprehension performance with other cognitive domains, particularly memory.

6.2 Qualitative Assessment

In parallel with the quantitative data, qualitative observations were made by the researchers during the administration of the O52 test. These observations included noting specific difficulties participants had with certain types of instructions or with specific linguistic structures, such as syntactic complexity or the need for multitasking. Clinicians also recorded any behavioral responses or communication strategies used by the participants to compensate for comprehension deficits, such as asking for clarification or using non-verbal cues.

6.3 Statistical Analysis

Data analysis was performed using descriptive and inferential statistics. Descriptive statistics were used to summarize the participants' performance on the O52 test, including mean scores and standard deviations. Inferential statistical methods, including correlation analysis, were applied to examine the relationship between cognitive impairment (measured by the DMS-48) and performance on the O52 test. This helped identify patterns of decline in oral comprehension in relation to the severity of Alzheimer's disease.

6.4 Ethical Considerations

Ethical approval for this study was obtained from the relevant institutional review board. Informed consent was provided by all participants or their legal guardians, ensuring that they were fully aware of the study's purpose, procedures, and potential risks. Confidentiality of all participant data was maintained throughout the research process.

7. Study Tools

This study utilized several standardized tools and assessments to evaluate the oral comprehension abilities and cognitive status of elderly patients diagnosed with moderate-stage Alzheimer's disease. The tools used were carefully selected to ensure a comprehensive evaluation of the participants' cognitive and linguistic functions. Below are the primary study tools employed in this research:

7.1 O52 Test (Oral Comprehension Test)

The O52 test is a well-established tool used to assess oral comprehension, particularly in individuals with cognitive impairments such as Alzheimer's disease. This test evaluates a participant's ability to understand spoken instructions, ranging from simple to complex, and includes tasks that require participants to respond verbally or by pointing to appropriate images or objects. The O52 test allows for the measurement of both basic language processing and more advanced levels of comprehension that involve multi-step instructions and syntactic complexity. It provides valuable data on the participant's ability to process and comprehend verbal information in real-time.

7.2 Clinical Observations

In addition to standardized testing tools, clinical observations were made during the administration of the O52 test. These observations focused on identifying specific challenges participants faced while completing the test, such as difficulties understanding complex instructions or issues with maintaining attention and focus. The clinicians also noted any compensatory strategies used by participants, such as asking for clarification or relying on non-verbal communication. These qualitative observations were crucial in providing context to the quantitative data and understanding the real-life impact of Alzheimer's-related language deficits on communication.

8. Alzheimer's disease

Alzheimer's disease is a progressive neurodegenerative disorder characterized by cognitive decline, which primarily affects memory, language, and executive functions (Feldman, 2006). It is the most common cause of dementia, a term used to describe a decline in memory, thinking, and social abilities severe enough to interfere with daily functioning. AD is typically diagnosed in individuals aged 65 and older, but early-onset forms can occur in those under 65 years (Alzheimer's Association, 2020).

At the core of Alzheimer's disease are abnormal accumulations of amyloid plaques and tau tangles in the brain, leading to neuronal dysfunction and cell death. These changes are most pronounced in the hippocampus and cortex, regions involved in memory and higher cognitive functions (Kumar et al., 2015). As the disease progresses, these brain changes disrupt neural

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circuits essential for normal cognition, resulting in the clinical symptoms of Alzheimer's, such as memory loss, difficulty with language, and impaired executive function (Thompson et al., 2007). The clinical manifestations of Alzheimer's disease typically begin with mild cognitive impairment, characterized by subtle memory loss and cognitive lapses that do not yet interfere with daily life (Petersen et al., 2014). As the disease advances, individuals experience more severe memory deficits, including an inability to recall recent events, recognize loved ones, and understand verbal instructions (Mendez, 2017). This decline in cognitive function significantly impairs communication abilities, with language deficits often becoming more pronounced as the disease progresses (Taler & Phillips, 2008).

8.1 Alzheimer's Disease Risk Factors

Several risk factors contribute to the onset and progression of Alzheimer's disease, including genetic, environmental, and lifestyle factors. The strongest genetic risk factor is the presence of the apolipoprotein E (APOE) $\epsilon 4$ allele, which increases the risk of developing AD (Corder et al., 1993). Other risk factors include advancing age, family history of the disease, and cardiovascular health issues such as hypertension and diabetes (Sperling et al., 2011). Additionally, lifestyle factors such as physical inactivity, poor diet, and social isolation have been shown to contribute to an increased risk of developing Alzheimer's disease. Conversely, engaging in regular physical exercise, maintaining a balanced diet, and keeping the brain active through activities such as reading or socializing can help reduce the risk of cognitive decline (Lindsay et al., 2010).

9. Previous Studies:

Several studies have investigated the relationship between Alzheimer's disease and language comprehension, providing a foundation for this study's exploration of the O52 test as a diagnostic tool. These studies highlight the progressive nature of cognitive decline, particularly in oral comprehension, and underscore the importance of early detection of language deficits in Alzheimer's disease.

Mendez, M. F., & Shapira, J. S. (2014)

examined the cognitive and linguistic deficits in Alzheimer's patients, focusing on the progression of language impairments. They found that oral comprehension deteriorated significantly as Alzheimer's disease progressed, with patients often struggling to understand multi-step verbal instructions. This aligns with the current study's finding that Alzheimer's patients exhibit marked deficits in oral comprehension as the disease advances (Mendez & Shapira, 2014).

Taler, V., & Phillips, N. A. (2008)

conducted a comprehensive review of language processing in Alzheimer's disease. Their findings indicated that deficits in understanding spoken language were among the earliest cognitive impairments observed in Alzheimer's patients. They noted that complex instructions and abstract language were particularly challenging, which corresponds with this study's focus on understanding complex verbal instructions using the O52 test (Taler & Phillips, 2008).

Vernooij-Dassen, M. J., & Moniz-Cook, E. (2003)

explored language impairments in Alzheimer's patients and highlighted the potential of language testing as a diagnostic tool. They emphasized the importance of assessing both verbal comprehension and memory to understand cognitive decline, which aligns with the current research by recognizing the significance of assessing oral comprehension (Vernooij-Dassen & Moniz-Cook, 2003).

Dapretto, M., & Bookheimer, S. Y. (2003)

focused on the neural substrates of language comprehension in Alzheimer's patients, using neuroimaging to show that Alzheimer's disease leads to a breakdown in neural networks responsible for processing language. Their findings support the hypothesis that oral comprehension abilities are impaired in Alzheimer's patients due to neural degeneration (Dapretto & Bookheimer, 2003).

Poullisse, C., & Bongaerts, T. (2000)

investigated the difficulties Alzheimer's patients face when processing complex verbal instructions. Their research highlighted how language comprehension deficits impact daily functioning, particularly in understanding multi-step spoken commands (Poullisse & Bongaerts, 2000).

10. Results and discussion

In this study, eight participants diagnosed with Alzheimer's disease (aged 75 to 85) were assessed using the O52 test to measure their oral comprehension abilities. The results demonstrate a clear decline in language comprehension as the severity of Alzheimer's disease progresses, with notable differences observed in the participants' ability to understand verbal instructions. The participants were asked to complete a series of tasks requiring them to follow increasingly complex verbal instructions. The overall performance was measured based on the accuracy of responses and the participants' ability to follow multi-step instructions.

10.1 Quantitative Synthesis

The table below presents the aggregated results of eight patients with Alzheimer's disease, covering a range from early to advanced stages. Scores are provided across three

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comprehension strategies (Lexical, Morphosyntactic, and Narrative), along with general performance metrics and repetition frequency.

Table (1) : Quantitative Synthesis for results after applying Khomsi's O52 screening tool

Patient	Age	Stage	L	M-S	C	N1	D2	N2
1	79	Moderate	6	4	2	12	4	18
2	82	Mod-Adv	4	2	1	9	3	12
3	76	Moderate	8	5	2	15	6	21
4	85	Advanced	3	1	0	6	2	8
5	78	Moderate	10	7	4	20	6	26
6	80	Mod-Adv	6	4	2	14	5	19
7	75	Early	12	10	6	24	8	30
8	85	Advanced	4	2	1	10	3	13

Patient	P	A-C	C-D	AD1	AD2	L%	M-S%	C%
1	26	10.35	43.80	6	4	35.29%	17.39%	16.66%
2	19	8.75	39.50	7	5	23.52%	8.69%	8.33%
3	31	11.65	47.25	5	4	47.05%	21.73%	16.66%
4	14	6.20	33.40	8	6	17.64%	4.34%	0.00%
5	38	14.80	53.20	3	2	58.82%	30.43%	33.33%
6	28	10.40	47.20	5	4	35.29%	17.39%	16.67%
7	44	17.30	57.60	2	1	70.59%	43.47%	50.00%
8	20	6.60	42.80	6	5	23.53%	8.69%	8.33%

L = Lexical strategy.

M-S = Morphosyntactic strategy.

C = Narrative strategy.

N1 = baseline comprehension.

N2 = post-repetition score.

D2 = delta increase

P = total positive responses

A-C and C-D = learning and variability metrics

AD1 and AD2 = repetitions needed during first and second administration.

Percentages are calculated against the maximum number of correct answers for each strategy: 17 (L), 23 (M-S), and 12 (C).

10.2 Qualitative Synthesis

10.2.1 Lexical Comprehension:

Lexical comprehension appeared relatively preserved in patients at early or moderate stages (Patients 03, 05, 07), with success rates ranging from 35% to 70%. These individuals retained partial access to core semantic representations, indicating that basic word recognition may remain functional in early Alzheimer's. Conversely, patients at advanced stages (Patients 04, 08) demonstrated severe impairments, with performance dropping below 25%, highlighting disruption in temporal lobe-mediated semantic networks.

10.2.2 Morphosyntactic Comprehension:

Performance on the morphosyntactic strategy was globally weaker across all patients. Even those in moderate stages displayed substantial difficulty in interpreting syntactic structures such as verb tenses, agreement, or negation, with scores often below 30%. Patients at advanced stages (e.g., 04, 08) showed almost total breakdown in this domain, with success rates falling below 10%, likely due to frontal lobe atrophy affecting grammatical integration and sentence parsing.

10.2.3 Narrative Comprehension:

Narrative comprehension was the most consistently impaired strategy across the cohort. Most patients achieved very low scores, often below 20%, with multiple patients scoring only 1 or 0 out of 12 (Patients 02, 04, 08). This reflects a serious disruption in the integration of contextual, sequential, and inferential elements required for discourse-level understanding. Even in early-stage Alzheimer's (Patient 07), although narrative comprehension reached 50%, signs of executive dysfunction and episodic disorganization were already evident.

11. General Observations

N1 and N2 Scores: Patients at early or moderate stages showed significant improvement from baseline (N1) to repetition (N2), with increases ranging from +6 to +8 correct answers. Advanced-stage patients had minimal gains, suggesting reduced neural plasticity and working memory support. **P Values and C–D Scores:** Mid-range P scores (e.g., 28–44) and elevated C–D variability indices were observed in moderate cases, reflecting inconsistency in strategy application. Advanced-stage cases exhibited both low P and lower variability, indicating global, uniform decline. **Learning Effect (A–C):** Scores here were moderately elevated in patients with some preserved cognitive capacity (Patients 03, 05, 07), implying partial learning or adaptation. Patients in advanced stages demonstrated poor A–C scores, reflecting an inability to benefit from repetition. **Repetition Needs (AD1–AD2):** Repetition frequency

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was highest among advanced patients (5–8 repetitions), while early-stage individuals required minimal support (1–2 repetitions), further validating the progression-dependent nature of auditory processing deficits in AD.

12. Conclusion

The findings from this study reinforce and expand upon existing research by demonstrating that oral comprehension progressively deteriorates across lexical, morphosyntactic, and narrative dimensions as Alzheimer's disease advances. The O52 test has proven to be a sensitive tool for detecting this decline, highlighting distinct patterns of breakdown that correspond with the disease stage. Lexical comprehension tends to be relatively preserved in the early stages, while morphosyntactic and especially narrative processing deteriorate more rapidly, reflecting the combined degradation of semantic memory, syntactic integration, and executive function. These findings align closely with those reported by Mendez and Shapira (2014), who observed that patients with Alzheimer's experience increasing difficulty understanding multi-step verbal instructions as the disease progresses a pattern also clearly reflected in the low narrative comprehension scores observed in our moderate and advanced-stage patients. Similarly, Taler and Phillips (2008) identified spoken language comprehension deficits as some of the earliest cognitive impairments in Alzheimer's disease, particularly when the verbal input involves syntactic complexity or abstraction. This is echoed in the current study's morphosyntactic performance patterns, which declined consistently even in moderate cases. Furthermore, the importance of assessing oral comprehension as part of broader cognitive profiling is underscored by Vernooij-Dassen and Moniz-Cook (2003), who advocated for language testing as a means of both diagnostic clarification and tracking cognitive decline. The present study supports this view, demonstrating that the O52 test can differentiate between stages of Alzheimer's based on oral comprehension profiles. In line with Dapretto and Bookheimer (2003), whose neuroimaging work linked Alzheimer's-related language impairments to breakdowns in neural networks responsible for comprehension, our findings illustrate how strategy-specific deficits mirror underlying neural degeneration—particularly in the temporal and frontal cortices. Finally, the current results resonate with the work of Poulisse and Bongaerts (2000), who highlighted the profound impact of impaired verbal instruction processing on daily functioning in Alzheimer's patients. The elevated repetition requirements and low success rates in narrative strategies observed in our advanced-stage participants illustrate this functional breakdown clearly. In summary, the O52 test offers a comprehensive framework for assessing the multidimensional decline of oral comprehension in Alzheimer's disease, and its results are consistent with key findings in the literature. Its application may contribute to earlier detection, improved staging, and more tailored intervention planning in clinical practice.

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