Research Article

The Study of Noun and Verb Naming in Persian Alzheimer's Patients and Healthy Adults

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Abstract

Background: Word retrieval deficit is one of the common language problems reported in patients with Alzheimer's disease (AD).

Objectives: The present study investigated the noun and verb naming skills in patients with AD according to lexical class compared with healthy counterparts.

Methods: In this cross-sectional study, noun and verb naming were investigated in 17 patients with AD [mild to moderate based on the mini-mental state examination (MMSE)] and 17 healthy adults of the same age, gender, and education. To assess, the Persian aphasia naming test (including 50 nouns) and the verb picture naming test in Persian (90 verbs) were used. The data were analyzed with SPSS software version 26, and the significance level was α = 0.05. Spearman's correlation coefficient was used to analyze the relationship between noun and verb naming test scores in AD and healthy individuals. Additionally, the Mann-Whitney U test was employed to compare the mean scores of the tests between the two groups.

Results: The results indicated that both noun and verb naming in people with mild to moderate AD are significantly lower than in healthy adults (P < 0.001). Also, the verb naming deficit in AD is higher than that of nouns (P < 0.001).

Conclusions: Naming disorder is one of the most important language disorders in AD, and this problem is seen in verbs more than in nouns in mild to moderate AD. Verb naming deficit can lead to syntactic and eventually communication disorders in these patients.

Keywords: Alzheimer's Disease, Anomia, Dementia, Language Tests

1. Background

Alzheimer's disease (AD), the most common cause of dementia, is a neurodegenerative disorder characterized by impairments in memory, cognition, behavior, and language (1, 2). In 2024, approximately 6.9 million individuals in the United States were living with AD, affecting nearly 10.9% of adults aged 65 and older (2). In Iran, the prevalence of AD was estimated at 2.3% in 2017 (3). Among the early manifestations of AD, language impairment — particularly in the form of naming difficulties — has been identified as a prominent and progressive feature (4, 5). Language disturbances may begin years before diagnosis (6), encompassing issues such as word retrieval failure, impaired auditory and written comprehension, and empty speech (7). Naming disorders are frequently assessed in patients with AD through confrontational picture-naming tasks, which test the semantic, lexical, and phonological components of language (8). Patients with AD commonly struggle with naming and verbal fluency tasks, showing poorer performance compared to cognitively healthy individuals (9). Levelt's theory of language production identifies a multi-stage process — concept retrieval, lemma selection, morpho-phonological encoding, and production — each associated with activation in specific brain regions (10). For instance, the lemma stage involves the middle temporal gyrus, while lexical selection activates posterior temporal and Wernicke's areas, and phonetic encoding engages Broca's area (11). In patients with AD, damage at the lemma level is

thought to impair access to lexical nodes, particularly in noun and verb naming (12).

Although many studies have reported significant naming deficits in patients with AD compared to healthy controls (6-9, 13-16), the majority focus exclusively on noun naming. Bowles et al. and Almor et al. are among the few that examined verb naming, revealing inconsistent results regarding which category is more impaired (14, 17). Notably, Almor et al. found greater noun impairment but did not account for disease severity. Other studies, such as those by Shuttleworth and Huber, Williams et al., Lin et al., and Silagi et al., have consistently demonstrated significant performance differences across varying levels of AD severity when compared to healthy participants (4, 15-18). Based on the research, naming disorder is correlated with a more rapid progression of the illness (19) and whole-brain atrophy (20), further highlighting the diagnostic value of lexical retrieval measures in patients with AD (21).

2. Objectives

The present study aims to investigate noun and verb naming performance in Persian-speaking patients with AD across different severity levels and compare their results to a matched healthy control group. Given the limited number of studies assessing both grammatical categories — especially in non-English languages — this study addresses a critical gap. By examining naming deficits in the context of Persian language structure and cultural factors, the findings will contribute to the early identification of linguistic decline and inform the development of targeted therapeutic interventions and rehabilitation strategies within the Persian-speaking population.

3. Methods

3.1. Sample Size Determination and Sampling

The study examined 34 participants between the ages of 58 and 84, using a non-randomized sampling method. Seventeen individuals with AD (14 men and 3 women) were selected from the Iranian Alzheimer's Association (Ghasedak Rehabilitation Center), confirmed based on the neurologist's diagnosis and medical history. An additional 17 healthy individuals (13 men and 4 women) with similar mean ages and educational backgrounds were chosen from public centers, who were without any neurological and psychological diseases based on their self-declaration. The educational range of the participants was from under diploma to master's degree. The educational levels of patients with AD were as follows: Under diploma (35.3%), diploma (41.2%), bachelor's degree (11.8%), and above (11.8%). The healthy individuals' educational levels were under diploma (29.4%), diploma (41.2%), bachelor's degree (17.7%), and above (11.8%). The study included participants who met the following criteria for AD: No other neurological disorders such as Parkinson's or Multiple Sclerosis; no sensory impairments such as hearing loss; monolingualism (Persian); and a mild to moderate score on the mini-mental state examination (MMSE) (22). The diagnosis of AD was determined by reviewing the patient's medical records based on the neurologist's diagnosis. Participants were excluded if they had suffered from CVA, had severe AD, or were non-cooperative patients.

3.2. Tools

3.2.1. Mini-Mental State Examination

It is one of the most common tools for measuring general cognitive functions. This test was designed in 1975 by Folstein et al., and it evaluates cognitive issues including orientation, attention, memory, and language disorders. The advantages of this tool include low cost, high-speed performance, easy implementation, and minimal training (23). In this study, the Persian version of this test was used. Ansari et al. translated and culturally adapted it into Persian and found the cutoff score to be 23. This means that a score above 23 indicates normal cognitive ability, while a score below that indicates mild to severe cognitive impairment. Furthermore, the sensitivity and specificity of the MMSE were determined to be 98% and 100%, respectively (22). In this study, patients who scored between 20 to 23 were considered as having mild AD, while those who scored between 10 to 19 were classified as having moderate AD according to the MMSE (24).

3.2.2. Persian Aphasia Naming Test

It was performed using 50 non-colored noun pictures, where the examiner showed the pictures to the patients with AD and healthy individuals and asked them to name the pictures. Ten seconds were given to the patient to name each picture, and if there was no response, the examiner would provide a semantic cue and then a phonetic cue. The semantic cue consists of a single sentence that describes a picture, based on test instructions. On the other hand, the phonetic cue includes the expression of the syllable or the first sound of the word. If a subject provided a wrong answer or no answer at all, they received a score of zero. However, for

a correct answer (even with semantic and phonetic cues), a score of one was given. Based on the results, the internal consistency of the test was 0.96, and the test-retest correlation coefficient was 0.87 (25, 26).

3.2.3. Verb Picture Naming Test in Persian

The verb naming test includes 90 verbs in the original version and 90 verbs in the parallel version. In this study, 90 verbs from the original version were used, and the examiner presented them to the subject. In case of a correct answer, a score of 1 was given, and in case of a wrong answer or no answer, a score of zero was assigned to the subject. Results indicated that the face and content validity of the test were more than 0.85 and 0.98, respectively. The intraclass correlation coefficient (ICC) for total scores was equal to 0.98 (P < 0.001) and 0.96 (P < 0.001) (27).

3.3. Data Collection

First, the ethical approval code for the study was received from the ethical committee, and then, after completing the consent form (based on the standardized form of the TUMS Ethical Committee), the MMSE and the noun and verb naming tests were performed for patients with AD and healthy subjects. After checking the inclusion criteria in both groups, the Persian aphasia naming test (25), which included 50 pictures, was administered to the participants. The subject was asked to name each picture after seeing it. If the subject did not succeed in naming the image after 10 seconds of presenting the picture, the examiner provided a semantic cue (for example, for the picture of "glass", the semantic cue was: "We drink water with it"). If the subject failed to name it after 10 seconds, a phonological cue was presented (for example, presenting the first syllable or the first sound of the target word). If the subject did not succeed in naming, they would not receive a score. The scoring was 1 for a correct answer without any cue. Then, the picture verb naming test in Persian was administered (27), which included 90 verbs in the original version. Subjects were asked to name the activity after seeing each picture. The scoring system for the test was such that if the answer was correct, the score awarded was 1, and if the answer was wrong or not attempted, the score was zero. All the tests were administered to the participants by two speech and language pathologists.

3.4. Statistical Analysis

Nonparametric statistical tests were used because the data do not follow a normal distribution. Spearman's correlation coefficient was employed to investigate the relationship between the mean scores obtained in the noun and verb naming tests in patients with AD and healthy individuals. Additionally, to compare the mean scores in the noun and verb naming tests between the two groups of AD and healthy individuals, the Mann-Whitney U test was used. The data were analyzed using SPSS software version 26, and the significance level for the study was α = 0.05.

4. Results

As mentioned, 17 patients with AD (14 males, 3 females) and 17 healthy subjects (13 males, 4 females) were studied, and all subjects were in the age range of 58 to 85 years. In Tables 1, and 2, demographic properties are reported.

4.1. Comparison of Noun and Verb Naming in Alzheimer's Disease

Spearman's correlation coefficient was used to investigate the relationship between the mean scores obtained in the noun and verb naming tests in patients with AD and healthy individuals. The results indicated that there was a positive and significant relationship between the scores of the noun and verb naming tests in patients with AD (R = 0.749, P < 0.001), but there was no significant relationship in healthy individuals (Table 3).

4.2. Comparison of Noun and/or Verb Naming in Patients with Alzheimer's Disease and Homogeneous Healthy Individuals

To compare the mean scores in the noun and verb naming tests between the two groups of AD and healthy individuals, the Mann-Whitney U test was used. The results showed that there was a significant difference (P < 0.001) (Table 4). It should be noted that the effect size between the two groups in noun naming was 3.75, and in verb naming, it was 3.72.

5. Discussion

This study investigated noun and verb naming abilities in 17 Persian-speaking individuals with AD, comparing their performance with that of a demographically matched group of 17 healthy control subjects. The results demonstrated that participants with mild to moderate AD exhibited significantly lower accuracy in both noun and verb naming tasks. Notably, verb naming was more severely impaired than noun naming. To control for confounding variables such as age, gender, and education level — factors known to affect naming performance — participants in both

Table 1. Demographic Features in Patients with Alzheimer's Disease and Healthy Individuals [a]

Subjects	Age	MMSE	Noun Naming	Verb Naming
Patients	75.05 ± 8.99	16.59 ± 2.45	34.52 ± 11.34	54.47 ± 11.38
Healthy	69.94 ± 7.75	28.29 ± 1.61	49.23 ± 1.03	80.35 ± 8.74

Abbreviation: MMSE, mini-mental state examination.

[a] Values are expressed as mean ± SD.

Table 2. Educational Levels in Patients with Alzheimer's Disease and Healthy Individuals

Subjects and Educational Level	No. (%)
Patients	
Under diploma	6 (35.3)
Diploma	7 (41.2)
Bachelor's degree	2 (11.8)
Above	2 (11.8)
Healthy	
Under diploma	5 (29.4)
Diploma	7 (41.2)
Bachelor's degree	3 (17.7)
Above	2 (11.8)

Table 3. Correlation of Mean Scores Between Noun and Verb Naming Tests in Patients with Alzheimer's Disease and Healthy Individuals

Variables	Spearman's Correlation Coefficient	P-Value
Patients (n = 17)	0.749 [a]	< 0.001
Noun		
Verb		
Healthy individuals (n = 17)	0.319	0.212
Noun		
Verb		

[a] Correlation is significant at the 0.01 level (2-tailed).

groups were carefully matched. This methodological approach allowed the researchers to isolate the impact of AD on lexical retrieval more precisely. To enhance comprehension, the results of the study are organized into two distinct sections.

5.1. Noun and Verb Naming in Patients with Alzheimer's Disease Versus Healthy Controls

The current findings confirm prior research showing marked naming deficits in patients with AD. Studies by Lin et al., Knesevich et al., Bowles et al., Shuttleworth and Huber, Williams et al., Almor et al., , and Silagi et al. all reported significant impairments in noun and/or verb naming among patients with AD compared to controls (4, 13-18). Our results add to this body of evidence by showing similar outcomes in Persian speakers. Interestingly, no significant difference was observed between noun and verb naming in the control group, suggesting that healthy adults efficiently retrieve both grammatical classes with comparable accuracy, which supports their intact syntactic and semantic processing systems.

Naming disorders in AD are associated with disruptions at the lemma level, as described in Levelt's model of language production (10). At this stage, the syntactic properties of words are accessed, and for patients with AD, this process appears compromised — resulting in delayed or failed word retrieval, whether it be a noun or verb. This impairment is compounded by deficits in working memory and broader cognitive

Table 4. Comparison of the Average Scores in the Noun and Verb Naming Tests in the Two Groups of Alzheimer's Disease (N = 17) and Healthy Individuals (N = 17)

Variables	Mean Rank	Sum Of Rank	P-Value
Noun			< 0.001
Patients	9.35	159	
Healthy	25.65	436	
Verb			< 0.001
Patients	9.68	165.50	
Healthy	25.32	430.50	

functions (2). As the disease progresses, atrophy in brain regions associated with noun and verb processing, such as the temporal and frontal lobes, exacerbates these deficits, underscoring the critical role of lexical access in language production.

5.2. Comparison of Noun and Verb Naming Within Patients with Alzheimer's Disease

While patients with AD showed significant difficulty with both word classes, verb naming was found to be more challenging than noun naming. A strong positive correlation between the two naming scores suggests shared cognitive and linguistic underpinnings; however, the observed asymmetry favors greater vulnerability for verbs. These findings contrast with those of Almor et al., who found nouns to be more affected, though their study did not stratify patients by AD severity (17). In contrast, Mousavi et al., reported findings aligning with our own, noting poorer verb fluency in AD patients compared to noun-based tasks (28).

Several factors may explain this discrepancy. As Levelt describes, verbs require the retrieval of complex grammatical and syntactic features, which are determined post-activation at the lemma level — functions that are particularly disrupted in AD (10). Another study provided further insight by categorizing noun-verb differences into syntactic, lexical-grammatical, and semantic-conceptual domains (such as imageability and concreteness) (29). Verbs tend to be more abstract, less imageable, and morphologically complex — especially in Persian — thus placing greater demands on cognitive (including working memory and selective attention) and linguistic resources (30). Also, during early developmental stages, children often produce nouns prior to verbs, suggesting challenges in verb production (31). Moreover, neurologically, verb processing has been linked to left frontal lobe activity, while nouns are more associated with left temporal regions (32). Given that AD often affects both lobes, the higher complexity and cognitive load required for verbs may explain their greater impairment.

Finally, these results have clinical implications. Verb deficits can severely impact sentence construction and communication efficacy (22), emphasizing the need for targeted linguistic assessment and intervention. The relatively greater impairment in verb naming observed here supports designing therapies that address syntactic and morphosyntactic deficits in the early stages of AD. The study's limited sample size and design constraints hindered an in-depth analysis of gender and linguistic factors, highlighting the need for broader, longitudinal research in AD language deterioration.

5.3. Conclusions

The study highlights reduced verb naming abilities in patients with mild to moderate AD compared to healthy controls and emphasizes the complex factors contributing to cognitive and linguistic difficulties, underscoring the need for personalized clinical approaches and further study.

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Footnotes

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