



## Research Paper:

# Translation, Validity, and Reliability of the Persian Version of Aphasia Rapid Test for Acute Stroke



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### Conflict of interest

The authors declared no conflict of interest

## ABSTRACT

**Background & Objectives:** Aphasia is an acquired language disorder that affects daily communication and quality of life. Early diagnosis and the treatment of aphasia are important. In this regard, one of the screening tests is the Aphasia Rapid Test (ART). This study aimed to investigate the validity and reliability of this test and extend the use of ART in the acute phase for patients with aphasia.

**Methods:** The original version of ART was translated to Persian and 100 acute stroke patients were evaluated by ART. Besides, all the patients were assessed again after eight days by two independent raters to evaluate inter-rater reliability. Also, 70 patients were chosen to examine ART's predictive ability; they were assessed using the Persian version of Western Aphasia Battery, after three months.

**Results:** On day eight of the study, the Mean±SD ART was 11.26±2.03 for rater 1 and 11.44±2.04 for rater 2. Inter-rater reliability was good with the concordance correlation coefficient of 0.959 (95% CI: 0.939-0.972). Also, the Bland-Altman plot showed good agreement between raters without any significant trend/bias.

**Conclusion:** The ART is a test that includes features, such as reproducibility, predictability, and inter-rater reliability. This test is short and can be used in the acute phase of aphasia in patients with stroke.

**Keywords:** Aphasia dipar test, Inter-rater reliability, Stroke, Aphasia, Persian



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↑ *What is “already known” in this topic:*

*Aphasia is one of the most common consequences of stroke and affects daily communication and quality of life, so, early diagnosis is important. The Aphasia Rapid Test is a screening test that is validated and used in different languages but not in Persian.*

→ *What this article adds:*

*The Persian version of the Aphasia Rapid Test is a simple, fast, and short test that can be used to evaluate Persian speakers in the acute phase of the stroke.*

## 1. Introduction

Aphasia is an acquired language disorder caused by brain injuries, such as stroke or traumatic brain injury, and affects the individuals' abilities for verbal communication [1-3]. According to various studies, the prevalence of stroke among 65 years old and older people is 46 to 73 per 1000 people worldwide [4]. Almost 30% of stroke survivors are in the acute phase of aphasia, which affects their daily communication and quality of life [5]. The early diagnosis and treatment of aphasia are important, given the profound impact of aphasia on an individual's daily activities, quality of life, and communication. Various studies have suggested that the therapy of aphasia is effective, especially if it begins soon after the injury [6-8]. For example, Teasell et al. (2005) and Langhorne et al. (2011) believe that early treatment is much more effective than treatment that begins later. This is due to the association between spontaneous recovery and learning-related neural recovery [9, 10]. Therefore, tools for early screening and evaluation are essential for treatment decisions in aphasia management.

Ideally, an evaluation tool for bedside screening in aphasia must be simple, fast, short, and comprehensive, particularly for patients with acute stroke. One of the tests that meet these conditions has been recently developed by Azuar et al. (2013). The test is called the Aphasia Rapid Test (ART), which addresses all the abovementioned features. For example, ART can be completed in less than three minutes, making it short and fast enough to be used at the bedside. Regarding comprehensiveness, this test has a 26-point scale allocated to various items, including simple comprehension, the repetition of words and sentences, naming, semantic fluency, and dysarthric examination. The higher scores of ART indicate more impairment. Additionally, previous studies have shown

sensitivity, reproducibility, high predict value, external validation, and the inter-rater reliability of this test [11-14]. Moreover, Benghanem et al. (2019) reported the correlation of ART scores with the lesion size and location and the patient performance three months after the stroke. The results in patients with severe aphasia (initially), larger infarct size, or critical damage to the left temporoparietal area are associated with poor language outcomes in ART, within three months [15].

Many tests have been developed for aphasia in the chronic phase and the clinical and paraclinical features related to this stage. This is while an early diagnosis of aphasia and identifying the patient's functional abilities at the bedside and acute phase are important factors in planning for treatment [16-20]. Despite the importance of early diagnosis and the treatment of aphasia, no quick and short test has been developed in Iran to assess language features in the acute phase of aphasia. Daily, many Persian speakers in Iran suffer from aphasia due to stroke or traumatic brain injuries, while no test is available to evaluate their language function in the early stages. Therefore, this study aimed to translate the ART and then investigate the validity and reliability of the Persian version of ART.

## 2. Materials and Methods

The authors searched different literature for the brief and practical tests of evaluating language and cognitive areas in acute stroke. The ART was selected for this study. The ART includes order performance (simple and complex), repetition (word and sentence), naming (object naming and verbal fluency), and dysarthria scaling. The scores range from 0 to 26; a higher score shows worse impairments. Also, this test has no time limitation for patients to answer. Permission for translation to the Persian language was obtained from the corresponding authors. The translation steps were performed based on

the methods adopted by the International Quality of Life Assessment project, as is described in the following.

Initially, the original version of the ART was translated into the Persian language by two certified translators. Next, researchers and translators agreed upon the translation in a meeting. Then, translators rated the difficulty of the translation from 0 to 100 (0 means no difficulty, and 100 means having the most difficulty). Afterward, the quality of the translation was rated by two different translators. The quality of translation is defined as the clearness of sentences and phrases (the use of simple and easy words to understand), the use of a common style of language (the lack of technical, specialized, and fictitious words), and concept similarity (reflecting the content of the original version). In this step, the rating scale ranged from 0 to 100 (0 means no quality, and 100 means the most quality). Then, the backward translation was done. Two different translators who had not seen the original version translated the Persian version back into the original one. This step aimed to check whether the items' contents remain in the Persian version. Finally, the Persian version was given to specialists to check for the probable problems in the structure of the test, the cultural proportion of words, the ambiguous perception of words, and the difficulty of content perception.

### Participants

For this study, 100 patients (female and male) were recruited from hospitals affiliated to Tehran and Iran University of Medical Sciences. All patients had a left-hemisphere stroke. The site of injury was diagnosed by the neurologist in charge, based on the patient's brain scan, which was either a CT scan or MRI. Patients with other neurologic disorders, such as Parkinson disease, multiple sclerosis, Alzheimer disease, auditory or visual disorders, previous stroke, or low consciousness were excluded from the study. All participants were monolingual Persian speakers.

### Procedure

Each participant completed the test twice. Firstly, the Persian version of ART was conducted at the bedside in the hospital. All participants (100 patients) were asked to perform test items and the scores have been recorded. Again, after eight days, these patients were assessed with the Persian version of ART by two independent raters. Each examiner rated the patient in a one-way blinded manner. Inter-rater reliability has been achieved from the result of this part. Also, 70 patients were chosen to examine ART's predictive diagnostic. To evaluate the

predictive ability of the test, the language impairment of these patients was assessed after three months using another test called the Persian version of Western Aphasia Battery (WAB).

### Outcome measurements

The ART was performed in the acute phase of the stroke. This test is quick and short and includes the following components described in detail with scoring.

Simple orders (0=performs both tasks correctly, 1=performs one task correctly, and 2=performs neither task correctly); complex order (0=performs the task in less than 10 s, 1=performs the task in more than 10 s or requires the order to be repeated, 2=performs the task partially, 3=does not perform the task); word repetition and sentence repetition with similar scoring (0=normal repetition, 1=abnormal repetition but the word or sentence is correct and recognizable by the examiner, 2=non-repetition or unrecognizable word or sentence); object naming (0=normal naming, 1=abnormal naming but the word is correct and recognizable by the examiner,

2=wrong naming or unrecognizable word); dysarthria (0=normal, 1=minor, 2=moderate, 3=severe); semantic fluency with animal naming (0=more than 15 words, 1=between 11 and 15 words, 2=between 6 and 10 words, 3=between 3 and 5 words, 4=between 0 and 2 words). The total score of this test is 26; a higher score indicates the severity of disorder [11].

Another test performed in the chronic phase was the Persian version of WAB, which is validated by Nilipour et al.; this test determines the severity and type of aphasia based on the score. The Persian version of WAB includes content (5 points for conversational questions and 5 points for spontaneous speech content), fluency (10 points), auditory comprehension (10 points for yes/no questions), command comprehension (10 points), naming (10 points), and word and sentence repetition (10 points). In this test, the aphasia quotient range of 0 to 25, 26 to 50, 56 to 75, and 75 and above is very severe, severe, moderate, and mild, respectively.

### Statistical analysis

The inter-rater reliability of the test was assessed using the concordance correlation coefficient, weighted kappa, and Bland-Altman plot. The concordance correlation coefficient evaluates the degree to which the pairs of observations fall on the 45° line through the origin. This coefficient is a product of the Pearson correlation

**Table 1.** Demographic and clinical characteristics of the patients (N=100)

Variables		Mean±SD/No. (%)
Age	years	68.53±11.06
Sex	Male	72 (72.0)
	Female	28 (28.0)
Educational level	Illiterate	28 (28.0)
	Primary	45 (45.0)
	Secondary	20 (20.0)
	University	7 (7.0)
Type of stroke	Ischemic	67 (67.0)
	Hemorrhagic	33 (33.0)
Hemiparesis	No	37 (37.0)
	Yes	63 (63.0)

coefficient (a measure of precision) and bias correction factor (a measure of accuracy). Also, the Pearson correlation coefficients were used to examine the relationship between the scores of ART and WAB. All data analyses were performed using the MedCalc software for Windows, version 18.9.1 (MedCalc Software, Ostend, Belgium), and SPSS for Windows, version 16.0 (SPSS Inc., Chicago, IL, USA).

### 3. Results

#### Patients' characteristics

**Table 1** outlines the demographic and clinical characteristics of the patients. The Mean±SD age of the patients was 68.53±11.06 years (ranged 44-88 years). Of the patients studied, 72% were male, 28% were illiterate, 67% had an ischemic stroke, and 63% had hemiparesis.

#### Descriptive statistics of the Persian version of ART (PART)

**Table 2** presents the descriptive statistics of the PART scores. The Mean±SD of total PART was 20.37±2.13 at day one. As anticipated, the PART scores had significantly decreased at day eight (**Figure 1**). The Mean±SD of total PART score at day eight was 11.26±2.03 for rater 1 and 11±2.04 for Rater 2.

#### Inter-rater reliability

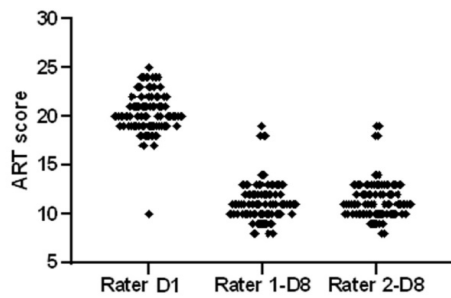
The concordance correlation coefficient was 0.959 (95% CI: 0.939-0.972) with a Pearson correlation coefficient of 0.962 and a bias correction factor of 0.996 (**Figure 2**). Besides, the weighted kappa was 0.826 (95% CI: 0.774-0.878), indicating a very good level of agreement.

Also, the agreement between rater 1 and rater 2 for PART scores was assessed through the visual inspection of the Bland-Altman plot. **Figure 3** shows that 92% of the points are between the lower and upper limits of

**Table 2.** Descriptive statistics of the PART scores

Variables	Mean±SD	Median (IQR)	Min-Max
ART, Day 1	20.37±2.13	20 (19 - 21.75)	10 – 25
ART, Day 8, Rater 1	11.26±2.03	11 (10 - 12)	8 – 19
ART, Day 8, Rater 2	11.44±2.04	11 (10 - 13)	8 – 19

IQR: interquartile range.



**Figure 1.** Dot plot demonstrating total part scores of each rater

agreement. Moreover, as seen in this plot, no considerable trend/bias was found in the scattering of points.

### Correlation between PART and WAB

The ART score was correlated with the WAB score at day one ( $r=-0.656$ ,  $P<0.001$ ) and day eight ( $r=-0.813$ ,  $P<0.001$ ) for rater 1. Besides, comparison indicated that the correlation at day eight was significantly stronger than the correlation at day one ( $Z=2.44$ ,  $P=0.015$ ). Similar correlation was obtained for rater 2 at day eight ( $r=-0.862$ ,  $P<0.001$ ).

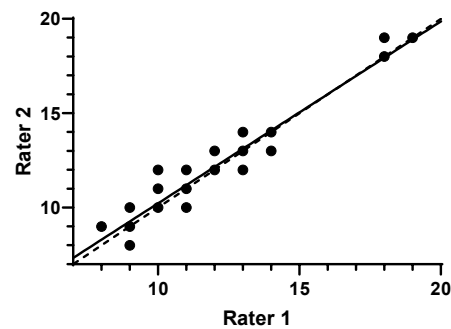
### Administration duration

The time needed to complete PART was calculated for all patients; it was 173 seconds.

## 4. Discussion

The ART is a bedside screening tool for evaluating and monitoring poststroke aphasic patients [11, 14]. This test considers the essential aspects of communication problems in aphasia (ie, comprehension, repetition, and naming). Also, it is a brief and simple test to perform shortly after the stroke. Besides, ART is translatable into different languages and can be used in clinical practice [11-14]. Therefore, the researchers selected the ART to translate it into the Persian language and performed it in Iranian Persian speakers in the acute phase after stroke.

The current study primarily aimed to investigate the changes in ART scores over time. The results showed that the mean score of the PART at day eight of the study was significantly decreased, compared with day one. The mean score was 20.37 on day one, while it decreased to 11.26 for rater 1 and 11.44 for rater 2 on day eight. This finding is consistent with the study of Azuar et al., who reported that the mean total ART score was 19.6 at day one, then, decreased to 12.5 at day eight [11]. Also, Benganem et al. found a dramatic change in ART

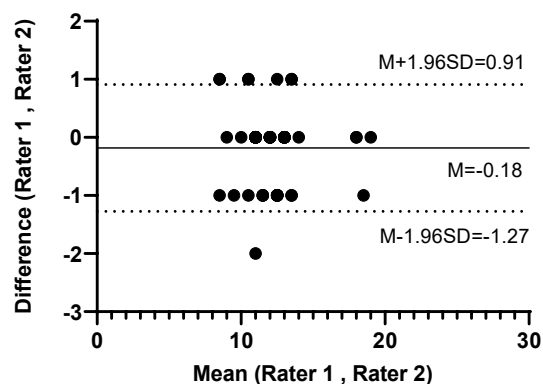


**Figure 2.** Scatter plot of rater 2 vs rater 1 on part scores

Solid line shows the best-fit line and the dashed line shows the 45° line through the origin.

score during the first week after stroke, with the median values of 15 and 10 on days one and seven, respectively [15]. Based on Azuar et al., the ART score could significantly change during the first week after stroke [11]. This change is probably related to spontaneous recovery after stroke. Spontaneous recovery refers to improvement in the patient's activity and function over time without intervention [21-23]. However, this spontaneous recovery is not complete and the magnitude and the rate of recovery depend on different factors, such as the age of the patient; the initial severity of impairment [24]; the lesion size and site [25-28]; and the extent to which neuroplasticity improves sensory, motor, cognitive, and language skills [29]. Given the speed of spontaneous recovery after stroke, the decrease in PART score over the first week after stroke could be an indicator of the patient's improvement. The result of this study showed that the PART score is sensitive to changes in the language ability of the patient, in the first week after stroke.

Secondly, on day eight, the authors measured the inter-rater reliability of the test, yielding a good concordance correlation coefficient of 0.959. This finding is in line



**Figure 3.** Bland and Altman plot for assessing agreement between Rater 1 and Rater 2 on ART scores

with the French study of Azuar et al. with a coefficient of concordance of 0.990 (rater 1=13.4, rater 2=13.49) [11], and the Italian study of Panebianco et al. with a coefficient of concordance of 0.99 (rater 1=9.38, rater 2=9) [13]. Also, the Portuguese study of Tábuas-Pereira et al. reported an excellent concordance coefficient (0.985) between rater 1 and rater 2 [14]. The significant inter-rater reliability found in the current study suggests that different examiners can perform PART without affecting the results. Although these results indicate the reliability between raters, further studies should investigate the test results obtained by other persons working in the acute patient care unit.

Another goal of the current study was to examine the predictability of ART in the prognosis of aphasia severity. Thus, we examined the correlation of the ART scores on days one and eight with the WAB scores three months after stroke. Results showed a strong correlation between the ART and WAB scores. That is, patients with better ART scores showed less severity in the WAB test after three months. Interestingly, the correlation was stronger with the scores on day eight, compared with day one. Similarly, Azuar et al. examined the predictability of ART by calculating the correlation between ART score and the score of the Boston Diagnostic Aphasia Examination. Similar to the present results, they found a high correlation between early results from ART and later results from the Boston Diagnostic Aphasia Examination [11]. Moreover, the Portuguese study showed a high correlation between the ART scores and the Lisbon aphasia examination [14]. The Italian study did not compare the ART scores with other aphasia tests [13]. Therefore, in line with previous studies, the current study showed that the ART test could be used as a tool to predict the prognosis of aphasia severity; it also stands true for the Persian version of this test. The initial severity of aphasia is considered one of the most important factors for determining prognosis and long-term improvement [30, 31]. This study provided further evidence for the value of early aphasia measurements in prognosis, and subsequently, the management of aphasia.

The ART test is known for its shortness, which is pointed out in previous studies. Therefore, we also examined the length of the test administration. The authors found a mean of 173 seconds for the administration of ART. This duration is close to findings from Italian, French, and Portuguese studies that reported the mean duration of 169, 171, and 154 seconds, respectively [11, 13, 14]. Thus, the present study indicates that similar to other versions the Persian version of ART can be completed in a short time, making it a suitable tool for aphasia

measurement at the bedside. Also, in a quick test, the patient's fatigue cannot affect responses. As other studies point out, the fatigue factor should be considered during the test [32, 33].

Also, the results of the current study provide further evidence on the low cultural sensitivity of the ART. The translation and use of ART in populations with different languages, including Persian (by the present study), Italian, French, Portuguese, and Hindi [11-14], showed that this test can be used with very minor changes in different cultures, regardless of the language. Thus, the words and sentences used in ART are culturally independent. Also, ART has no pictures, making it less complicated for transferring into other cultures. Therefore, the least dependency of ART on culture has made it a transferable test into the Persian-speaking population of Iran with the least changes.

Overall, the cultural independence of ART is one of its special advantages. Another advantage is the short duration of the test shown by the present study and previous studies, so fatigue does not affect responses. Besides its benefits, ART comes with limitations. For example, the test lacks the evaluation of reading and writing, which are the basic functions of language. These are important aspects that should be considered by a test because attention to these areas offers alternative and augmentative therapies for patients with severe aphasia and limited speech. Moreover, the test does not include measurements for dysarthria and apraxia in detail. However, ART appears to be superior to other aphasia screening tests for two reasons: first, assigning a brief section to dysarthria scoring, and second, the points at the end of each section to consider apraxia in responses; these make scoring more flexible.

## 5. Conclusion

The ART include features, such as reproducibility, predictability, and inter-rater reliability; the results of the present study also show these features. Similar to the original version, the Persian version of ART developed by the present study is short and can be used in the acute phase of Persian-speaking patients with stroke at the bedside, in Iran. However, ART does not contain some features, including apraxia, reading and writing skills, and executive functions. Therefore, it provides a surface assessment of language impairments, so it cannot be used as a comprehensive test.

## Ethical Considerations

### Compliance with ethical guidelines

The study was approved by The Ethical Committee of Iran University of Medical Sciences (IR.IUMS.REC.1397.283).

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### Authors' contributions

Conceptualization: Seyyedeh Zohre Mousavi, Reyhaneh Jafari, Mohammad Moez Shahramnia, Mahsa Pourmohammadi, Nahid Jalilehvand; Methodology: Seyyedeh Zohre Mousavi, Saman Maroufizadeh; Investigation: Seyyedeh Zohre Mousavi, Reyhaneh Jafari, Mohammad Moez Shahramnia, Mahsa Pourmohammadi; Writing – Original draft: Seyyedeh Zohre Mousavi, Reyhaneh Jafari; Writing – review & editing, Funding Acquisition, Resources: All authors.

### Conflict of interest

The authors declared no conflict of interest

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## ترجمه، روایی، و پایایی نسخه‌ی فارسی آزمون سریع آفازی در دوره‌ی حاد سکته مغزی

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### چکیده

**مقدمه** آفازی اختلال اکتسابی زبان به علت آسیب مغزی است که ارتباطات روزمره و کیفیت زندگی را تحت تأثیر قرار می‌دهد. پس تشخیص و درمان به موقع آن بسیار مهم است. بنابراین، ایجاد ابزارهایی برای ارزیابی در فاز حاد بیماری بسیار مهم است که علاوه بر جامع بودن، ساده، سریع، و کوتاه باشند. یکی از این تست‌ها، تست سریع آفازی (ART) می‌باشد که این ویژگی‌ها را دارد. هدف از مطالعه حاضر، اعتبارسنجی این تست و نیز کاربرد آن در بیماران مبتلا به سکته در فاز حاد بیماری است.

**مواد و روش‌ها** نسخه اصلی تست سریع آفازی با در نظر گرفتن روند ترجمه به زبان فارسی برگردانده شد. در این مطالعه، تعداد ۱۰۰ بیمار مبتلا به سکته مغزی در فاز حاد وارد مطالعه شدند. این بیماران به فاصله ۸ روز بعد به منظور بررسی پایایی درون آزمونگر مجدداً توسط دو آزمونگر مستقل مورد ارزیابی قرار گرفتند. از میان بیماران تعداد ۷۰ نفر ۳ ماه بعد توسط آزمون WAB مورد بررسی قرار گرفتند تا قدرت پیش‌بینی آزمون ART بررسی شود.

**یافته‌ها** میانگین امتیاز تست در روز ۸ برای ارزیابی ۱۱/۲۶ با انحراف معیار ۲/۰۳ و برای ارزیابی ۱۱،۴۴ با انحراف معیار ۲/۰۴ به دست آمد. پایایی بین ارزیابی با ضریب همبستگی تطبیقی ۰/۹۵۹ (۰/۹۳۹ - ۰/۹۷۲) CI: ۹۵٪ و ضریب همبستگی پیرسون ۰/۹۶۲ خوب گزارش شد. Bland-Altman نیز نشان داد که توافق خوبی بین ارزیابی‌ها وجود دارد.

**نتیجه‌گیری** ART آزمونی است که ویژگی‌هایی همچون کوتاه بودن، تکرارپذیری، قابلیت پیش‌بینی و پایایی بین ارزیابی را دارد و قابلیت کاربرد در فاز حاد بیماران مبتلا به سکته مغزی در بستر را فراهم می‌آورد.

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### کلیدواژه‌ها:

تست سریع آفازی،  
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