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Original Research

Effectiveness of Symbolic Communication Therapy on Expressive Abilities in Post- Stroke Aphasia

Evarina Sembiring[1], Flora Sijabat[2], Harold Situmorang[3], Amila Amila[4*], Zuraidah Mastura Daulay[5], Dearni Trinitas Zebua[6]

[1,2,4,5,6] Faculty of Pharmacy and Health Sciences, Sari Mutiara Indonesia University, Indonesia
[3] Faculty of Science and Information Technology, Sari Mutiara Indonesia University, Indonesia

ABSTRACT

Background: *Aphasia is a major post-stroke complication that causes communication difficulties and significantly reduces patients' quality of life. Conventional speech therapy is often limited by time and resources, highlighting the need for technology-based alternatives that can be practiced independently at home. This study aimed to evaluate the effectiveness of a symbolic communication therapy (SCT) application in improving communication skills among stroke patients with aphasia.*

Methods: *A one-group pretest–posttest quasi-experimental design was used with 15 motor-aphasia patients recruited from the Neurology Ward of Haji Medan General Hospital. Participants used an Android-based SCT application for six weeks (two 30-minute sessions per day). Functional communication ability was assessed using the Derby Functional Communication Scale (DFCS) before and after intervention. Data were analyzed using the Wilcoxon Signed-Rank Test.*

Results: *The SCT application significantly improved patients' communication performance. DFCS scores increased in expression (5.93 to 6.93), comprehension (5.47 to 7.93), and interaction (4.93 to 6.93) domains ($p < 0.001$).*

Conclusion: *The SCT application effectively enhances functional communication in post-stroke aphasia patients and can serve as a complementary, low-cost tool within neurological rehabilitation programs, particularly in resource-limited healthcare settings.*

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CONTACT
Amila
✉
mila_difa@yahoo.co.id
Faculty of Pharmacy and Health Sciences, Sari Mutiara Indonesia University. Jl. Kapten Muslim No. 79, Medan, North Sumatra, Indonesia.

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INTRODUCTION

Stroke remains one of the leading causes of long-term disability worldwide, including in Indonesia. According to the World Health Organization (WHO), over 15 million people experience a stroke each year, with approximately five million resulting in significant disability. Indonesia's 2018 Basic health Research Survey reported a

national stroke prevalence of 10.9 per 1.000 population, making it one of the highest-burden non-communicable diseases. North Sumatra ranked among the top 20 provinces with a prevalence of 9.3%, and stroke incidents in younger populations have increased in line with changing lifestyles (Kementerian Kesehatan Republik Indonenesia, 2019); (Sinaga et al., 2018); (Amila, Sembiring, & Girsang, 2021).

One of the major complications following a stroke is aphasia, a communication disorder affecting approximately 30–40% of stroke survivors. This condition not only limits patients' ability to express basic needs but also hinders therapeutic communication with healthcare professionals and family members (Amila, Sembiring, & Girsang, 2021; Liu et al., 2023). As a result, patients are vulnerable to social isolation, post-stroke depression (PSD), and even suicide risk (Vyas et al., 2021). It is estimated that 28–35% to as high as 85% of individuals with post-stroke aphasia experience PSD, typically within the first three months (Amila, Sembiring, & Aryani, 2021; Amila, Sembiring, & Sulaiman, 2021). Their quality of life is significantly lower compared to stroke patients without aphasia (Liu et al., 2023; Sukmawati & Tarmizi, 2022; Khedr et al., 2020).

PSD is known to increase morbidity, mortality, disability, and reduce overall quality of life (Olsson & Schalling, 2025). Unfortunately, data on the prevalence of aphasia and PSD in Indonesia remain scarce (Amila et al., 2019; Vyas et al., 2021). Alarmingly, some stroke survivors have reported suicidal ideation as early as four days post-stroke. However, specific data on post-stroke suicide rates in Indonesia are currently unavailable. Currently, the approach to managing aphasic patients in hospitals remains highly limited. Healthcare services are predominantly focused on formal speech therapy, yet the availability of certified speech therapists is extremely scarce in most hospital settings.

Moreover, there is a notable lack of practical, evidence-based interventions designed to assist healthcare professionals in communicating effectively with patients with aphasia. In daily clinical practice, medical staff often encounter significant difficulties in establishing communication with aphasic patients, leading to frequent misunderstandings, patient frustration, and a decline in the overall quality of care (Liu et al., 2023; Vyas et al., 2021). Symbolic Communication Therapy (SCT) has emerged as an innovative approach that utilizes visual symbols, images, or symbol-based applications to bridge communication barriers. SCT offers a low-cost, practical solution that can be implemented by healthcare providers without the need for sophisticated equipment.

Recent studies have demonstrated that the use of symbolic media can significantly enhance communication participation, enabling patients to express basic needs, emotions, and desires through non-verbal means, thereby contributing to an overall improvement in their quality of life (Khairan & Habib, 2024; Schlesinger et al., 2024). However, most research supporting the effectiveness of ST remains limited to populations outside Indonesia or relies on high-tech tools that may not be applicable in Indonesian healthcare facilities. Scientific evidence regarding the direct effectiveness of SCT in rehabilitation settings within the context of nursing in Indonesia remains very limited.

The government currently supports the digitization of stroke services through the Ministry of Health's Non-Communicable Diseases Program. Information technology in stroke management can improve treatment effectiveness, reduce disability and mortality, and improve quality of life (Asmila et al., 2021; Rashed et al., 2024).

Research on post-stroke aphasia has predominantly focused on speech therapy or AAC methods delivered by speech therapists, while evidence on communication interventions designed and implemented by nurses remains highly limited. The purpose of this study is to identify the effectiveness of SCT in improving the expressive abilities of stroke patients with aphasia, thereby addressing issues to support the achievement of the Sustainable Development Goals (SDGs) for improving well-being.

MATERIALS AND METHOD

Research Design

This study is a quantitative study with a quasi-experimental design using a one-group pretest–posttest design, which aims to evaluate the initial effectiveness of symbolic therapy applications in post-stroke aphasia patients. A design without a control group was chosen because this study is a pilot study to assess feasibility and potential benefits before conducting a large-scale trial.

Population and Sample Research

The sample size of 15 participants was determined due to the limited number of motor aphasia patients who met the inclusion criteria during the study period. Although small, this sample size is appropriate for a preliminary study aimed at assessing the feasibility and initial effectiveness of the intervention in a clinical population with naturally low case numbers. Recruitment was carried out in the Neurology Ward of the Haji Provincial General Hospital of North Sumatra using purposive sampling, whereby all patients who met the inclusion criteria were recruited sequentially until the sample size was reached.

The sample inclusion criteria included patients with a diagnosis of hemorrhagic or non-hemorrhagic stroke who experienced motor aphasia based on the results of the Frenchay Aphasia Screening Test (FAST), were in a state of compos mentis and medically stable, were accompanied by family members who were willing to be involved in communication exercises at home, were able to recognize visual symbols, and were willing to participate (patients and families signed informed consent). Exclusion criteria included patients with dysarthria or articulation disorders without aphasia, patients with severe visual or cognitive impairments, a history of depression prior to stroke or currently undergoing antidepressant therapy, and patients with signs of increased intracranial pressure, such as projectile vomiting, severe dizziness, unstable blood pressure, or decreased consciousness.

Data Collection

The independent variable in this study was the symbolic communication therapy provided to the patients, while the dependent variable was the expressive communication ability of post-stroke patients with motor aphasia. Data collection procedures were carried out in the Neurology Room of the Haji Medan General Hospital. In the initial stage, researchers provided direct training to patients with aphasia and their families on the use of the application, written guidelines, and demonstrations of symbolic therapy exercises.

One primary family member was appointed as a training companion and was responsible for assisting patients during therapy at home. After the initial training, the exercises were continued independently at home for 6 weeks (42 days) with a frequency of twice a day (morning and evening) and a duration of ±30 minutes per session,

resulting in a total of 84 therapy sessions. Monitoring and guidance were conducted weekly through online communication and telephone calls. Exercise companions were given daily activity checklists to record the symbols used, duration, and patient responses. These records were collected weekly to monitor patient compliance and progress and served as the basis for routine evaluation by researchers.

The intervention was carried out using an Android-based symbolic therapy application that functions as a communication training medium for patients with aphasia, containing simple visual symbols in the form of images, text, and audio. The symbols cover categories of basic needs, family members, body parts, daily activities, and emotional expressions. Each session included exercises in pointing to pictures, naming, spelling, reading, writing, and repeating. The application system provided voice instructions, and caregivers recorded the patient's ability to point, imitate, or speak. Caregivers assessed the patient's progress through observation sheets, and the exercises were repeated at home.

Instruments

The instrument used was the Derby Functional Communication Scale (DFCS) developed by Derby et al. (2017) to assess patients' functional communication abilities before and after symbolic therapy. This instrument has been translated and shows high reliability ($\alpha = 0.89$) and adequate construct validity, making it suitable for use with aphasia patients in Indonesia. The DFCS instrument consists of three assessment aspects, namely Expression (E), Understanding (U), and Interaction (I). Each aspect covers eight items with a score of 0–8, so that the total score ranges from 0–24. A higher score indicates better functional communication skills in all three assessment aspects. The stages of the intervention procedure are as follows: Day 1: Pretest using DFCS. Days 2 to 42: Symbolic therapy intervention (2 sessions/day, 30 minutes). Day 43: Post-test using DFCS.

Data Analysis

Data were analyzed using SPSS version 20.0. Descriptive statistics (frequency and percentage) were used to describe the characteristics of the respondents. The Wilcoxon Signed Rank Test non-parametric statistical test was used because the data were not normally distributed. This test was used to determine the difference in communication skills before and after the intervention. A p-value < 0.05 was considered statistically significant.

Ethical Clearance

This study has obtained ethical approval from the Health Research Ethics Committee of the Faculty of Medicine, University of Muhammadiyah North Sumatra, with number: 1538/KEPK/FKUMSU/2025. All participants were informed about the study’s objectives and provided written consent. The study also adhered to the ethical principles of beneficence, non-maleficence, and justice by ensuring potential benefit, minimizing harm, and applying fair and non-discriminatory recruitment of eligible patients.

RESULTS

Table 1. Respondent Characteristics (n = 15)

Characteristics	n	%
Gender		
Male	9	60
Female	6	40
Age (years)		
45–54	4	26.7
55–64	6	40
65–70	5	33
Type of Stroke		
Ischemic	12	80
Hemorrhagic	3	20
Education Level		
Elementary	0	0
Junior High School	1	6.67
High School	12	80
University	2	13.3
Frequency of Stroke		
First	12	80
Recurrent	3	20

Table 1 shows that most respondents were male (60%). The most common age group was 55–64 years (40%), and the predominant type of stroke was ischemic (80%). Most respondents had completed high school education (80%). Furthermore, based on stroke frequency, most respondents experienced their first stroke (80%) (Table 1).

Table 2. Communication Ability of Stroke Patients with Aphasia Before and After Intervention (n =15)

Variables	Mean		Min-Max	
	Pre ± SD	Post ± SD	Pre	Post
Expression	5.93 ± 0.799	6.93 ± 0.799	5-7	7-9
Understanding	5.47 ± 0.516	7.93 ± 0.799	5-6	7-9
Interaction	4.93 ± 0.799	6.93 ± 0.799	4-6	6

Table 2 shows that the average language ability of aphasia patients before the application of SCT in the aspects of expression, comprehension, and interaction was 5.93, 5.47, and 4.93, respectively. After therapy, the scores increased to 6.93, 7.93, and 6.93 in the same aspects (Table 2).

Table 3. Effectiveness of SCT Application on the Communication Ability of Stroke Patients (n = 15)

Test Statistics	Total Post – Total Pre
Z	-3.508
Asymp. Sig. (2-tailed)	< 0.001

Table 3 shows that the application of Symbolic Communication Therapy (SCT) effectively improves functional communication skills in post-stroke aphasia patients. The results of the analysis using the Wilcoxon Signed Ranks Test show a significant

difference between communication scores before and after intervention ($Z = –3.508$; $p < 0.001$). This indicates that after receiving intervention through the SCT application, patients' communication skills improved significantly in all domains assessed by the Derby Functional Communication Scale (DFCS).

DISCUSSION

The results showed that most respondents were aged between 55 and 64 years. This finding is consistent with several studies in Indonesia and abroad that report that the middle to older age group (50–70 years) has the highest prevalence of stroke and aphasia cases (Danardhono et al., 2023; Filipska-Blejder et al., 2023). Fitri et al. (2024) also found that the average age of onset of primary progressive aphasia (PPA) is 59 ± 2.96 years. This age group is vulnerable to stroke due to an increase in degenerative risk factors in blood vessels, hypertension, diabetes mellitus, and lifestyle factors such as smoking and lack of physical activity, all of which increase the risk of stroke (Benjamin et al., 2019).

Most respondents were male. This finding is consistent with the research at H. Adam Malik General Hospital in Medan and (Restikasari et al., 2022) at Dr. Hasan Sadikin General Hospital in Bandung, which both reported that more than 50% of stroke patients in Indonesia are male. Theoretically, non-modifiable risk factors for stroke include genetic predisposition, age, gender, race, and previous history of stroke (Kementerian Kesehatan Republik Indonesia, 2023). Men have a stronger degree of linguistic function laterality than women, so in cases of unilateral stroke, men are at greater risk of developing aphasia (Wallentin, 2018).

The majority of respondents had a high school education. These results are consistent with previous studies (Amila et al., 2025; Handayani, 2019; Purba et al., 2024) which state that education level is closely related to a person's knowledge of disease and prevention efforts. Education level plays an important role in the incidence of stroke. A recent study shows that individuals with higher education levels have a lower risk of stroke compared to those with lower education levels (Che et al., 2020).

The most common type of stroke experienced by respondents was ischemic stroke, as also reported in studies (Amila et al., 2025; Purba et al., 2024; Wahyuni & Dewi, 2018). Ischemic stroke is a rapidly developing syndrome from acute onset to the onset of non-epileptic neurological deficits due to the formation of infarcts in brain tissue. This condition occurs because the blood supply to the brain is disrupted, usually due to blockages in the cerebral arteries (Kuriakose & Xiao, 2020).

Most respondents had a history of first stroke in line with the study results (Amila et al., 2025; Purba et al., 2024). Globally, approximately 13.7 million new cases of stroke occur each year, with 5.5 million deaths, and the majority are first-time occurrences. The frequency of stroke attacks affects the extent of brain damage that impacts speech and language function. Patients with recurrent strokes generally have poorer rehabilitation outcomes than first-time stroke patients, due to cumulative brain damage and decreased neuroplasticity (Ng et al., 2016; Wang et al., 2022). Risk factors such as hypertension, diabetes, and heart disease also increase the likelihood of recurrence and worsen clinical outcomes.

Several studies report that approximately 20–35% of first-time stroke patients experience aphasia, particularly global and motor aphasia. Although it only occurs once, lesions affecting the frontal lobe in the dominant left hemisphere can cause language and mood disorders. Lesions in the left hemisphere are more often associated with

depression than those in the right hemisphere, especially when they are close to the left frontal lobe (Khedr et al., 2020; Grönberg et al., 2022).

The results of this study indicate an improvement in the communication abilities of patients with aphasia after receiving symbolic therapy, which indicates the effectiveness of a symbol-based approach in supporting language function recovery. This improvement reflects meaningful progress in all aspects of functional communication. During the intervention, patients were asked to select symbols, then say them aloud (expression), follow one to two symbol-based instructions (comprehension), and engage in brief conversations with nurses or caregivers (interaction).

These results are in line with research showing that the use of visual aids in the form of images, text with keywords, and written symbols has been proven to facilitate patients' language comprehension and expression. Symbols act as visual cues that stimulate the activation of language areas in the brain, thereby helping patients convey meaning when their verbal abilities are still limited. Furthermore, the use of Augmentative and Alternative Communication (AAC) has been proven to improve patients' communication skills and quality of life through increased independence and social interaction. Patients who use AAC generally show higher levels of satisfaction in their relationships with family, friends, and meaningful daily activities (Katsuno et al., 2022).

Neuropsychologically, symbolic therapy utilizes nonverbal communication pathways as a compensatory mechanism for damage to the language areas in the left hemisphere. This activity involves the visual association areas and semantic memory systems that play a role in connecting perception and speech production. Repeated stimulation through visual symbols supports the process of neuroplasticity, which is the brain's ability to form new neural connections after injury (Katsuno et al., 2022).

Based on the results of observations and daily reports during the intervention, patients showed gradual progress in functional communication skills, including improvements in expression, comprehension, and interaction. In the early stages of therapy, most patients were only able to point to symbols without saying them. However, after repeated practice, patients began to be able to pronounce simple words, especially common nouns that describe daily needs such as eating, drinking, and pain. This reinforces previous research that the use of symbols and visual cues can facilitate the word retrieval process and reactivate language networks in the brain (Katsuno et al., 2022).

In addition to improved expression, progress was also seen in comprehension. Patients became increasingly able to recognize symbols, understand visual instructions, and follow two-step commands independently. This process shows that visual media can strengthen semantic associations and help patients connect images with the concepts they represent. These results are consistent with previous studies that found that visual information, including facial expressions and mouth movements, improves word (Krason et al., 2023).

Improvements were also seen in interaction, where patients began to show initiative to communicate, maintain eye contact, and use symbols to respond or ask questions. Patients appear more confident, socially active, and participate in simple conversations. These findings are consistent with previous studies stating that a multimodal communication approach (including symbols and alternative modalities) can improve the communication and social participation of patients with chronic aphasia. (Kaviani et al., 2018).

Furthermore, the use of Augmentative and Alternative Communication (AAC) applications helps patients recognize and use symbols, but their effectiveness is highly dependent on the duration and consistency of practice. These results support previous research that short interventions (≤10 days) are not sufficient to produce meaningful improvements in functional communication skills. Therefore, structured, repetitive, and continuous symbolic training is a key factor in the success of therapy (Nakkawita et al., 2023).

Overall, the application of SCT not only improves language skills partially but also strengthens overall communication functions. The use of symbols helps patients convey meaning, while repeated practice improves spontaneity and fluency in communication. Family involvement and emotional support during home practice increase patient motivation and compliance, thereby accelerating cognitive and emotional adaptation to therapy. Social support has been shown to play an important role in the language recovery and quality of life of patients with aphasia (Kaviani et al., 2018).

The effectiveness of SCT appears to be more optimal in patients with mild to moderate aphasia, as it can improve the efficiency of expression and communication of basic needs with the support of caregivers. Thus, the application of SCT is recommended as a complementary therapy to support conventional speech therapy, especially when accompanied by structured training, family support, and regular professional monitoring. In patients with mild aphasia, symbolic applications play a greater role in improving expression efficiency and naming fluency, while in patients with moderate aphasia, the focus is on improving functional communication with caregiver support.

Although the results of this study show promising findings, there are several limitations that need to be considered. The small sample size and focus only on patients with mild to moderate motor aphasia limits the generalization of the results. Other factors such as patient motivation, family support, and limitations of the application features can affect the achievement of therapy. This study also did not assess psychosocial aspects such as overall quality of life.

CONCLUSION

The study found improvements in expressive ability, comprehension, and interaction among post-stroke patients with motor aphasia after receiving symbolic communication therapy. These findings indicate that symbolic communication therapy is effective in enhancing verbal communication abilities in individuals with motor aphasia following stroke. The implications of this study highlight the importance of integrating symbolic communication therapy into stroke rehabilitation programs as a low-cost, practical, and effective intervention to improve patient communication outcomes and overall quality of life.

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