Scientific Research Publishing

Open Journal of Therapy and Rehabilitation, 2025, 13(2), 54-63
https://www.scirp.org/journal/ojtr
ISSN Online: 2332-1830
ISSN Print: 2332-1822

Prognostic Factors in Vascular Motor Aphasia after Music Therapy

Jouonang Teugang Annick-Sandra[1], Diagne Ngor Side[2,3], Niakam Mbouleup Falonne Tiffany[1], Tsemo Yimta Grace Maïva[1], Badiane Jacky[1], Ngoule Mark Olivier[1], Mondomobe Atchom Alex Cyril[1], Tonga Emmanuel Mylène[1], Bangweni Claude Bernard[1], Mundih Njohjam Noelar[1], Diop Sène Marieme Soda[1,3], Ndiaye Moustapha[1,3], Diop Amadou Gallo[1,3]

[1]Neurology Department, National University Hospital Center, Fann, Dakar
[2]Department of Physical Medicine and Rehabilitation, Fann University Hospital Center, Dakar, Senegal
[3]Faculty of Medicine and Pharmacy, Cheikh Anta Diop University, Dakar, Senegal
Email: jastjouonang@gmail.com

How to cite this paper: Annick-Sandra, J.T., Ngor Side, D., Falonne Tiffany, N.M., Grace Maïva, T.Y., Jacky, B., Mark Olivier, N., Alex Cyril, M.A., Emmanuel Mylène, T., Claude Bernard, B., Noelar, M.N., Soda, D.S.M., Moustapha, N. and Amadou Gallo, D. (2025) Prognostic Factors in Vascular Motor Aphasia after Music Therapy. *Open Journal of Therapy and Rehabilitation*, **13**, 54-63.
https://doi.org/10.4236/ojtr.2025.132006

Received: January 20, 2025
Accepted: May 9, 2025
Published: May 12, 2025

Abstract

Aphasia is a language disorder linked to brain damage or dysfunction, characterized by difficulties in expression and/or comprehension. Aphasia is common after a stroke and may require lengthy, costly, and sometimes inappropriate treatments, which can hinder the patient's socio-professional life. The use of self-administered rehabilitation methods, such as music therapy, could improve the functional outcomes of aphasic patients. **Objectives**: To determine the prognostic factors of post-stroke motor aphasia treated with music therapy. **Methodology**: This was a prospective, multicenter cohort study involving patients with verbal expression disorders of vascular origin, without a history of motor aphasia or cognitive disorders prior to the stroke. Aphasia was assessed using the Language screening test (LAST). Patients were randomly divided into three groups: GBI1 (speech therapy), GBI2 (music therapy), and GNBI (no rehabilitation). Therapeutic sessions were conducted for up to 3 months for the intervention groups, with assessments made at admission, at month 1 (M1), and at month 3 (M3). **Results**: A total of 55 patients were included, predominantly male, with an average age of 61 years. Broca's aphasia accounted for 2 out of every 5 patients in the study population. The mean LAST scores at 1 month were 8.7 for GBI1, compared to 11.4 for GBI2 and 6.3 for GNBI. At 3 months, the scores were 10.55, 13.4, and 6, respectively. The prognostic factors for vascular motor aphasia treated with music therapy included the musical environment ($p = 0.012$), the type of stroke ($p = 0.006$), and the automatic series ($p = 0.009$). These factors were associated with the LAST score dimensions of naming, repetition, and automatic series. **Conclu-**

sion: Music therapy improves aphasia of vascular origin.

Keywords

Aphasia, Music Therapy, Stroke

1. Introduction

Aphasia is a language disorder linked to a brain injury or dysfunction that is characterized by difficulties in language expression and/or understanding [1]. It is present in 21 to 38% of patients with cerebrovascular accident or stroke and is associated with high morbidity, mortality and cost in the short and long term [3]. Aphasia after a stroke is estimated to affect 43 to 60 people out of 100,000 in Europe and the United States [3]. In Senegal, a prevalence of 32.35% has been reported in 2008. Motor or expressive aphasias were observed in 96.4% of cases, while 3.6% of aphasias were global [4]. In a study conducted in 2012 in Congo Brazzaville, Broca's aphasia was the most common type after stroke and had a significant impact on the patient's quality life [5]. Aphasia-associated disability negatively impacts the socio-professional life and mental health of patients. Speech therapy has been used to treat patients with aphasia [3]. Studies show that stimulation by music increases cerebral blood flow in patients with acute ischemic stroke and thus improves post-stroke recovery [3]. Listening to music promotes neurogenesis, regeneration and repair of neurons and neural circuits by modifying the secretions of hormones that play a role in the processes of brain plasticity [6]. During a song, major increases in blood flow were observed in the primary and secondary auditory cortex, the primary motor cortex, the frontal operculum, the supplementary motor area, the insula, the posterior cerebellum and the basal ganglia.

The repetition and harmonization of the melody produced very similar activation patterns. Listening and responding, have been reported to activate the frontal operculum (Broca's area) [7]. In addition, the brain activation networks for articulate language and music do not completely overlap. Thus, the left brain lesions at the origin of the language disorders of most cases of aphasia could partially spare the activation networks in the brain regions that are associated with music and singing. Passive listening to music effectively engages bilateral activations with an overlap of Broca's area. Singing (without words) correlates with the activation of left hemispheric regions (cingulate gyrus) and bilateral (pars orbitalis and insula) which have a positive effect on speech production in people with aphasias [8].

Recent studies suggest that active music-based interventions such as MIT (Melodic Intonation Therapy) are effective for speech improvement and motor recovery due to an increase in the number of fibers in the arcuate bundle of the right hemisphere. It is, however, a therapy in its own right, using the rhythmic component of music in an active way, as the patient recovers speech by singing, clapping to the rhythms and repeating phrases [9].

In Senegal, the critical shortages of rehabilitation services and speech therapists result in late and/or infrequent rehabilitation sessions. Under these conditions, the use of self-administered rehabilitative methods such as music therapy could improve the functional outcome of aphasic patients.

Thus, we carried out this study, the objective of which was to determine the prognostic factors of post-stroke motor aphasia, treated with music therapy.

2. Methodology

With the aim of contributing to and improving the overall management of patients, we conducted a study with the general objective of to determine the prognostic factors of post-stroke motor aphasia, treated with music therapy. The specific objectives were to:

- Describe the sociodemographic and clinical characteristics of patients with post-stroke aphasia.
- Determine the outcome of aphasia after music therapy.
- Identify prognostic factors for language recovery in patients receiving music therapy.

2.1. Patients et Methods

We conducted a 9-month prospective cohort study at the Neurology, and Physical Medicine and Rehabilitation departments of the Fann University Hospital Center in Dakar. Our study population consisted of patients with language disorders following a stroke, seen in the outpatient clinic and inpatient services. From this study population, we included all clinical stable patients verbal expressive language disorders of vascular origin confirmed by medical imaging, within two weeks of the stroke event. These patients constituted the intervention group (GBI). These patients were followed in neurovascular care for 3 months plus or minus 10 days, without speech rehabilitation (GNBI).

Patients with a history of persistent motor aphasia of vascular origin and those with severe cognitive impairment were excluded.

2.2. Assessment

Aphasia was assessed using the LAST score.

The Language Screening Test (LAST) is a 15-item test that screens for aphasia. The maximum score is 15, with each item scored as 1 (correct) or 0 (incorrect). The LAST has two subscores: expression and reception. The expression index measures naming, repetition, and automatic speech. The maximum score is 8 points. The receptive index measures picture recognition and verbal instructions. The maximum score is 7 points.

LAST b score

LAST-b (15)
Expression orale (8)

Continued

Dénomination (5)	crayon (1) Télévision (1) Girafe (1) Couteau (1) Papillon (1)
Répétition (2)	Littérature (1) Les vacanciers voudraient des glaces à la fraise (1)
Série automatique (1)	Compter de 1 à 10
Compréhension orale (7)	
Désignation (4)	Chapeau (1) Main (1) Voiture (1) Tomate (1)
Exécution d'ordres (3)	«Montrez le sol» (1) «Ne prenez pas la feuille mais la clef» (1) «Touchez une de vos oreilles avec un doigt, puis votre front avec deux doigts» (1)

Aphasia was defined by a total score of less than 15.

2.3. Procedure

The first step was to recruit all patients who met the inclusion criteria and had no exclusion criteria.

After consent, all included patients (GBI) were referred to the Physical and Rehabilitation Medicine department by the end of the fourth week, where they were randomly divided into two groups, according to the language rehabilitation method used: speech therapy (GBI1), and music therapy (GBI2). The third group, with no therapeutic intervention, was made up of patients who had been undergoing neurovascular consultation for 3 months without language rehabilitation (GBI).

For music therapy, based on an interview, patients or their relatives were asked to name 3 of their favorite songs, and to provide us with a recording of each song. A first rehearsal was carried out with the patient, to identify which song was easiest to repeat. For patients who didn't have any favorite songs, we suggested singing the national anthem or a well-known Koranic or Christian song. The music therapy session were continued at home. Patients had to repeat the chosen song once a day, three times a week for a minimum of three months. Telephone calls (twice a month) were made to monitor and reinforce the music therapy practice. Speech therapy sessions were also conducted for up to three months.

2.4. Ethical Considerations

Informed consent was obtained from all patients prior to inclusion. Data collected was anonymized to ensure patients' confidentiality.

Data analysis

Data were collected on data sheets, entered in a Microsoft Excel spreadsheet and analyzed with SPSS 26.0. Qualitative variables were expressed as frequencies and numbers. Quantitative variables were expressed as mean with standard deviation. The chi-square test was used to compare qualitative variables. A bivariate analysis was performed to determine the different prognostic factors associated with language recovery in the music therapy group. The threshold of significance was considered to be a value of $p < 0.05$.

3. Results

3.1. Socio-demographic Data

A total of 55 patients were included (Figure 1).

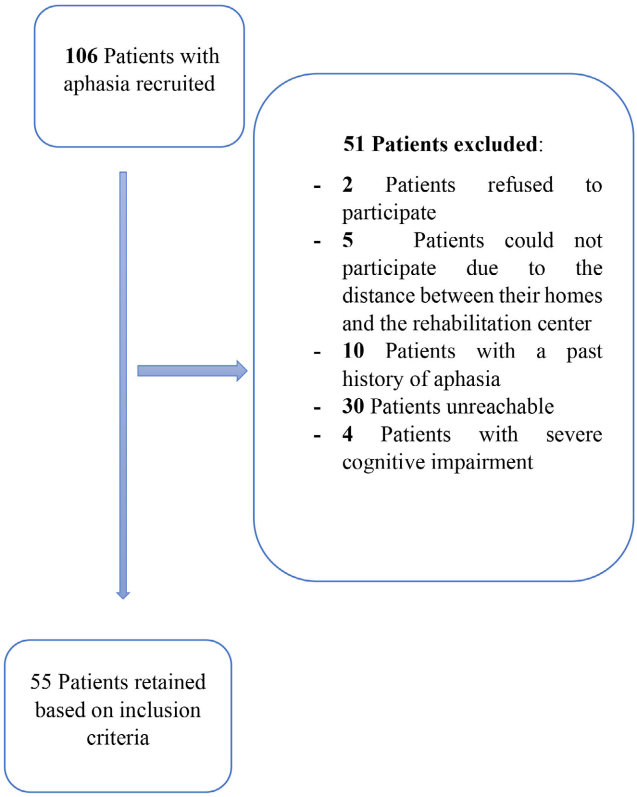

Figure 1. Recruitment process.

The mean age of our patients was 61.2 +/− 14.5 years, with a median of 65 years, a minimum of 16 years and a maximum of 89 years. The most affected age range was 50 - 70 (56.4%). Patients over 70 accounted for 21.8%. Other age groups, 30-50 and under 30, accounted for 16.4% and 5.5% respectively. The sex ratio was 1.2 and 61.8% had never been to school.

Aphasia-related data

Aphasia etiologies were dominated by ischemic stroke (87.3%). The main types of aphasia found were Broca's aphasia (41.8%), global aphasia (36.4%) and Pierre Marie's major aphasia (12.7%). Conduction aphasia and transcortical aphasia

were found in 3.6% each.

3.2. Evolution of Aphasia

Forty-six (46) patients were evaluated at 1 month, including 20 in music therapy, 10 in speech therapy and 16 in GNBI. Mean scores in GBI1 were 8.7 at one month, compared with 11.4 in GBI2 and 6.3 in GNBI. Eighty percent (80%) of speech therapy patients were aphasic, compared with 90% of music therapy patients and 87.2% in the non-rehabilitation group, at 1 month. At 3 months, the study population consisted of 38 patients, including 13 in music therapy, 9 in speech therapy and 16 in GNBI. Mean scores in GBI1 were 10.55 at three months, compared with 13.41 in GBI2 and 6 in GNBI. In the speech therapy group, 66.7% had aphasia, compared with 87.5% in the non-rehabilitation group and 46.2% in the music therapy group (p = 0.023) (Figure 2).

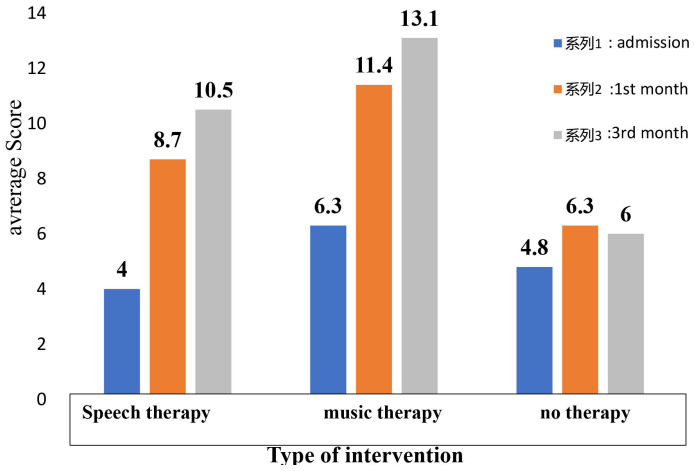

Figure 2. Distribution of the population according to the severity of aphasia.

3.3. Prognostic Factors for Aphasia at 3 Months

Based on the LAST-b score

A statistically significant improvement was obtained by speech therapy in the naming domain of the LAST-b score (p = 0.0001). Music therapy was associated with a significant improvement in naming (p = 0.001), repetition (p = 0.001) and automatic series (p = 0.014), musical environment (p = 0, 016), aphasia etiology (p = 0.006), automatic series (p = 0.009). No statistically significant difference was observed for listening comprehension (Table 1).

Table 1. Prognostic factors for aphasia under music therapy.

	Music therapy (N = 15)		
LAST items	Aphasic	Non aphasic	P value
Naming	4 (20%)	11(55%)	0.001
Repetition	4 (26.7%)	11(73.3%)	0.001
Automatic series	1 (6.7%)	14 (93.3%)	0.014
Oral comprehension	1 (6.7%)	14 (93.3%)	0.117

Continued

Prognostic factors		(n = 26)	(%)	P values
	Music environment	7	41.2	**0.016**
	Age	12	21.8	**0.237**
	Cohabitation	12	21.8	0.8
	Sex			
Socio-demographic	Feminine	6	16	0.9
	Masculin	6	16.7	
	Handedness			
	Right	12	22.2	0.07
	Left	0	0	
	Hobbies	12	21.8	0.08
	Stroke type			
	Ischemic	12	25	**0.006**
	Hemorrhagic	0	0	
Clinical	Repetition at onset	11	20.8	0.5
	Naming	10	20	0.420
	Automatic series	5	12.5	**0.009**

4. Discussion

4.1. Socio-demographic Aspects

In our study population, we found a mean age of onset of aphasia of 61y (16y - 89y) +/− 14 years. Adults aged 50-60 years were the most affected, with a median age of 65 years. These results are similar to those of Sène *et al.* in 2008 in Senegal, who found a mean age of 58.6 years (28 years-86 years) [4]. Runarvot *et al.* in 2024, in Normandy, found a median age of 63 years similar to our series [10]. Our study population was dominated by men (54.5%), with a sex ratio of 1.2; Ossou-Nguiet *et al.* also found a male predominance.

4.2. Clinical Aspects

Broca's aphasia accounted for 41.6% of the study population, global aphasia for 36.4%, Pierre Marie aphasia for 12.7%, transcortical motor aphasia and conduction aphasia for 3.6%, and anomia for 1.8%. These results are similar to those of Ossou-Nguiet *et al.*, Gnonlonfoun *et al.*, who found Broca's aphasia to be predominant [5] [11]. Pedersen *et al.* found a predominance of global aphasia (32%), followed by Broca's aphasia (12%), transcortical motor aphasia (2%), Wernicke's aphasia (16%), conduction aphasia (5%) and anomia (25%) [12]. This difference may be explained by the small sample size of our study.

4.3. Course and Prognostic Factors in Aphasia

In our series, patients receiving music therapy had better scores than those receiving speech therapy or no rehabilitation. Indeed, Godecke *et al.* had found a significant improvement in patients who had received aphasia-focused daily therapy

compared with patients who had received usual therapy [12]. Mattioli *et al*. in 2019, in Italy, found speech therapy to be effective in the early and chronic phase (> 6 months) after stroke, with greater effects observed if intensive treatment is provided [13].

These results may be explained by the reduced number of speech therapy sessions performed by patients in our series, due to the long distance between their homes and hospital. Furthermore, music therapy showed the greatest statistically significant improvement over time, suggesting a potentially greater efficacy of music therapy compared with other methods. These results are similar to those of Lim *et al*., who showed that music therapy improves language function in patients with subacute non-fluent aphasia [3]. Furthermore, such findings may indicate that there are other pathways involved in speech and singing, and that speech therapy and music therapy may be effective in treating aphasia by activating the brain via different pathways [3]. Our results are also similar to those of Liu *et al*. in 2022, who found that music therapy can improve functional communication, repetition and naming in patients with post-stroke aphasia, but does not significantly improve comprehension [14]. Belin *et al*. reported normal activation of language areas when patients benefited from music therapy [15]. Kil-Byung Lim *et al*. in 2013 found significant improvements in spontaneous speech, comprehension and naming in the subacute and chronic groups treated with music therapy. Hypotheses explaining the effectiveness of music therapy for aphasia include the fact that words can be pronounced more slowly when singing than when speaking. In addition, singing may offer more opportunities to distinguish phonemes made up of words and phrases due to syllable length. Non-fluent aphasic patients can become more fluent by slowly singing connected segments [3]. In addition, musical environment ($p = 0, 016$), aphasia etiology ($p = 0.008$) and automatic series ($p = 0.009$) were significantly associated with aphasia treated by music therapy at 3 months. Other prognostic factors associated with aphasia such as laterality, age, level of education, initial severity, lesion site and size were also found [7], [9], [12]. The difference in factors can be explained by the variation in the speech therapy techniques used [16].

5. Conclusions

Ultimately, we conducted a prospective cohort study, carried out from November 2023 to July 2024. The study included patients with verbal expression disorders of vascular origin, confirmed by brain imaging, who were hemodynamically stable, with no prior history of motor aphasia or cognitive disorders, and were evaluated using the LAST score. A total of 55 patients were included, with a predominance of male participants and a mean age of 61 years ± 14 years. Broca's aphasia accounted for two-fifths of the study population.

Furthermore, the progression of aphasia revealed average scores of 8.7 in the GBI1 group at 1 month, compared to 11.4 in the GBI2 group and 6.3 in the GNBI group. After 3 months, the average scores were 10.55 in GBI1, 13.41 in GBI2, and

6 in GNBI. In the music therapy group (GBI2), there was a statistically significant improvement in the expressive aspects of language, including naming, repetition, and automatic series.

Additionally, the musical environment, the etiology of aphasia, and the automatic series were found to be significant factors associated with aphasia treatment through music therapy.

However, there are some limitations to this study:

- The small sample size.
- The use of the LAST score, which may not be fully applicable to the Senegalese population.
- The monocentric nature of the study, which limits the generalizability of the results to other healthcare settings.
- The need for future studies to focus on well-established music therapy techniques, such as Melodic Intonation Therapy.

Therefore, it would be beneficial to extend the study with a larger cohort.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Luria, A.R. (2014) Aphasia Handbook**.** Florida, USA.

[2] Engelter, S.T., Gostynski, M., Papa, S., Frei, M., Born, C., Ajdacic-Gross, V., *et al.* (2006) Epidemiology of Aphasia Attributable to First Ischemic Stroke. *Stroke*, **37**, 1379-1384. https://doi.org/10.1161/01.str.0000221815.64093.8c

[3] Lim, K., Kim, Y., Lee, H., Yoo, J., Hwang, J.Y., Kim, J., *et al.* (2013) The Therapeutic Effect of Neurologic Music Therapy and Speech Language Therapy in Post-Stroke Aphasic Patients. *Annals of Rehabilitation Medicine*, **37**, 556-562. https://doi.org/10.5535/arm.2013.37.4.556

[4] Sène Diouf, F., Mapoure, Y., Ndiaye, M., Touré, K., Diagne, N.S., Thiam, A., *et al.* (2008) Vascular Aphasias: Clinical, Epidemiological and Evolutionary Aspects. *Dakar Medical*, **53**, 68-75.

[5] Ossou-Nguiet, P.M., Bandzouzi-Ndamba, B., Gnonlonfoun, D.D., Mouanga, A.M., Komi, A. and Matali, E. (2012) Qualité de vie des aphasiques post-AVC à Brazzaville. *Revue Neurologique*, **168**, A141. https://doi.org/10.1016/j.neurol.2012.01.363

[6] Louvet, P. and Freminet, M. (2015) Introduction de l'écoute musicale dans la prise en charge orthophonique de la personne ayant présenté un AVC. *Médecine humaine et pathologie*, **2015**, 182.

[7] Plowman, E., Hentz, B. and Ellis, C. (2011) Post-Stroke Aphasia Prognosis: A Review of Patient-Related and Stroke-Related Factors. *Journal of Evaluation in Clinical Practice*, **18**, 689-694. https://doi.org/10.1111/j.1365-2753.2011.01650.x.

[8] Zumbansen, A. (2014) Les bénéfices du chant dans la réadaptation de l'aphasie. Université de Montréal. https://papyrus.bib.umontreal.ca

[9] Kahlaoui, K. and Ansaldo, A.I. (2009) Récupération de l'aphasie d'origine vasculaire : facteurs de pronostic et apport de la neuro-imagerie fonctionnelle. *Revue Neurologique*, **165**, 233-242. https://doi.org/10.1016/j.neurol.2008.06.014

[10] Runarvot, M. (2023) L'avis des patients aphasiques post-AVC concernant leur fin de prise en soin orthophonique. Université de Caen Normandie.

[11] Gnonlonfoun, D., Adjien, C., Ossou-Nguiet, P.M., Mapoure, Y., Sissoko, A., Wouton, G., *et al.* (2017) Facteurs Associes a LA Qualite de Vie des Aphasiques Post Accident Vasculaire Cerebral En Milieu Hospitalier A Cotonou, Benin. *Mali Médical*, **32**, 27. https://openurl.ebsco.com/contentitem/gcd:124670464?sid=ebsco:plink:crawler&id=ebsco:gcd:124670464

[12] Godecke, E., Hird, K., Lalor, E.E., Rai, T. and Phillips, M.R. (2011) Very Early Post-stroke Aphasia Therapy: A Pilot Randomized Controlled Efficacy Trial. *International Journal of Stroke*, **7**, 635-644. https://doi.org/10.1111/j.1747-4949.2011.00631.x

[13] Mattioli, F. (2019) The Clinical Management and Rehabilitation of Post Stroke Aphasia in Italy: Evidences from the Literature and Clinical Experience. *Neurological Sciences*, **40**, 1329-1334. https://doi.org/10.1007/s10072-019-03844-0

[14] Liu, Q., Li, W., Yin, Y., Zhao, Z., Yang, Y., Zhao, Y., *et al.* (2021) The Effect of Music Therapy on Language Recovery in Patients with Aphasia after Stroke: A Systematic Review and Meta-Analysis. *Neurological Sciences*, **43**, 863-872. https://doi.org/10.1007/s10072-021-05743-9

[15] Belin, P., Zilbovicius, M., Remy, P., Francois, C., Guillaume, S., Chain, F., *et al.* (1996) Recovery from Nonfluent Aphasia after Melodic Intonation Therapy. *Neurology*, **47**, 1504-1511. https://doi.org/10.1212/wnl.47.6.1504

[16] Zhang, X., Yu, W., Teng, W., Lu, M., Wu, X., Yang, Y., *et al.* (2021) Effectiveness of Melodic Intonation Therapy in Chinese Mandarin on Non-Fluent Aphasia in Patients after Stroke: A Randomized Control Trial. *Frontiers in Neuroscience*, **15**, Article 648724. https://doi.org/10.3389/fnins.2021.648724