



# Impact of Naming Treatment on Linguistic and Cognitive Abilities in Persons with Aphasia: A Case Report

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## Abstract

Aphasia is a language impairment seen in individuals with brain damage. Naming impairments are commonly noticed in persons with aphasia. Speech-language therapy with traditional approaches in treating naming impairments was found effective in treating specific impairments at the level of semantic and phonemic processing. A combined approach in treatment is a new step toward training naming abilities in persons with aphasia. An intensive treatment plan with domain-specific techniques helps in the overall progression seen in communicative effectiveness. In this case report, we present a 23-year-old male with Wernicke's aphasia as a sequel of a cerebrovascular accident. We discuss the assessment of language and cognitive impairments and management of the language domain alone in the case reported. This case report highlights the impact of naming treatment on overall communicative effectiveness. The importance of early and intensive intervention programs for persons with aphasia could render a better prognosis. The speech-language pathologist's role in planning therapy (counterbalancing methods) goals for treating aphasia is vital in progress.

## Keywords

- ▶ aphasia
- ▶ naming
- ▶ intensive treatment
- ▶ early intervention
- ▶ communicative effectiveness

## Introduction

Aphasia is a loss or impairment of verbal communication caused by brain malfunction. The impairment of nearly all verbal skills, including inappropriate verbal expression, difficulty in understanding spoken or written language, poor repetition, difficulty in naming, and poor reading and writing skills, is the most common symptom.<sup>1</sup> Anomia is a hallmark deficit seen particularly in persons with aphasia (PWA)<sup>2</sup> and is most often attributed to impaired access to word representations. To treat anomia, speech and language therapy is crucial. Treatment plans are impairment-based, which are identified through detailed language assessments.<sup>3</sup> Also, the outcome is correlated well with language ability profile and site of lesion.

The foundation for rehabilitation research in naming disorders is with reference to the semantic and phonological

theories of naming retrieval<sup>4</sup> with widespread applications including semantic feature analysis (SFA)<sup>5</sup> and phonological component analysis (PCA).<sup>6</sup> A combination of these two approaches is being addressed in recent studies on naming impairment in aphasia.<sup>7,8</sup> There has been limited evaluation of the outcomes of naming therapy in the context of natural communication. Through this case study, one such attempt is made to address the discourse skills of a poststroke aphasia patient who received naming treatment using two typical procedures in the counterbalanced method.

## Case Report

A 23-year-old male reported difficulty in naming poststroke conditions to the outpatient department and had a poor understanding of speech in noisy conditions and required

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cues (written cues) to understand the speech. Detailed case history findings showed that he had an episode of cerebrovascular accident on June, 2019. His first language was Kannada, and English was his second language. The client's premorbid educational qualification was postgraduation in business management studies. He had fine motor incoordination in his right hand and was recommended for occupational therapy. The client was well-oriented and attentive during the intervention program. Written consent was taken from the client and caregivers during assessment and management programs.

## Assessments

A detailed assessment of the postmorbid condition was performed in various steps. Initially, a neurological assessment was done by a neurologist and the report revealed a large acute hemorrhagic infarct in the left middle cerebral artery territory, resulting in mild midline shift and herniation mass effect. Neurological signs like hemianopia (visual neglect), apraxia, and seizures were absent.

Further, the neurologist referred the client to undergo speech and language assessments. A speech language pathologist and an audiologist performed a baseline assessment of speech-language, cognitive, and audiological domains to address the client's communication barriers before therapy.

Speech language pathologists used different standardized tools developed in the Kannada language for linguistic and cognitive assessment. Western Aphasia Battery-Kannada (WAB-K)<sup>9</sup> was assessed to determine the aphasia quotient (AQ) and classify the type of aphasia.

Naming abilities were assessed under two-word classes (noun and verb) using the action naming test (ANT) and the Boston naming test (BNT) adapted to Kannada to assess verb and noun categories, respectively. Discourse was assessed using the picture description task through the discourse analysis scale.<sup>10</sup> Cognitive abilities were screened by subjective assessments like Montreal Cognitive Assessment<sup>11</sup> and further assessed in detail using Addenbrooke's Cognitive Examination—3<sup>rd</sup> version (ACE-III) developed in Kannada<sup>12</sup> to assess the attention, memory, fluency, language and visuospatial skills as the major cognitive domains. An objective measure of cognitive abilities was also assessed using Sem back tasks for lexical categories (fruits, vehicles, and common objects) developed in E prime software version 2. The outcome measures considered for further analysis were the Sem back threshold and reaction time for the accurate Sem back level.

As the client reported a poor understanding of speech in noisy conditions, a routine audiological evaluation, including ENT evaluation followed by pure tone audiometry, immittance, and auditory processing skills, was screened using a checklist.<sup>13</sup> The summary of scores obtained and findings derived from tests administered are summarized in ► **Table 1**.

Based on the pretherapy findings of speech-language, cognition, audiological, and neurological examination, the client was diagnosed with Wernicke's aphasia poststroke sequelae with moderate cognitive impairment with auditory processing disorder. The Speech Language Pathologist

assessment report correlated with neurological findings and was further recommended for speech and language therapy with suitable environmental modifications. Immediately after the assessment, the client was enrolled for rehabilitation process.

## Intervention

The primary goal of the intervention program was to improve naming abilities, in turn leading to effective communication with communication partners. The therapy session included training with naming techniques and counselling. The initial two sessions were difficult for the client because of poor auditory comprehension abilities to follow the instructions given through auditory modality alone. To facilitate better responses with better comprehension ability, Visual Action Therapy (VAT) was introduced along with traditional naming techniques. VAT is a most effective technique used in Wernicke's aphasia.<sup>14</sup> This technique helped to regain confidence in the client to relearn the basic communication skills and naming ability.

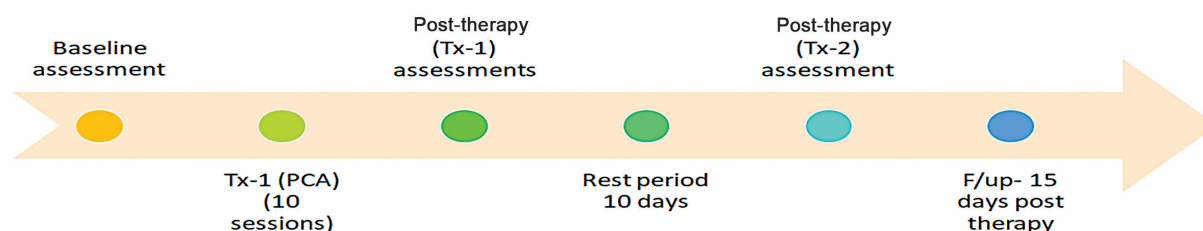
Following VAT, an intensive treatment on naming abilities was provided using SFA and PCA. The SFA and PCA training included "Noun" and "Verb" word classes. Further, the target word list under this word class was selected based on the classification of frequency of occurrence (low frequent vs. high frequent), imageability (low imageable vs. high imageable), and types of words (concrete vs. abstract) for SFA and number of syllables (bi syllabic and tri syllabic words) excluding imageability for PCA. A total of 60 items were framed to consider for both SFA and PCA treatment. An illustration of one stimulus for SFA and PCA in the Kannada language is shown in ► **Supplementary Figs. S1 and S2** (available in the online version). The stimulus for SFA treatment was presented visually, in colored line drawings, and PCA treatment in orthography form on an A4 size card. These stimuli (word class) framed by the investigator were validated by three trained speech-language pathologists who had more than 2 years of clinical experience in handling adult populations with language disorders.

Treatment was approximately 4 weeks, with five sessions per week, and each session lasted up to 1 hour per day.<sup>15</sup> PCA training (treatment 1) was initiated for the first instance, and SFA (treatment 2) in the second instance. A post-therapy measurement of treatment 1, including language, naming, discourse, and cognition, was performed after 10 sessions of PCA training. Following this, the post-therapy measurement of treatment 2 was performed after 10 sessions of SFA training. Thus, the training technique of PCA followed by SFA was applied to the participant for a total of 20 sessions with a break of 1 week between PCA and SFA training. These PCA and SFA trainings were provided by the investigator, who is a trained speech-language pathologist. Before the PCA treatment technique, a baseline measurement using WAB-K, ANT, BNT, ACE-III, and DQ which was noted. After PCA training, the language abilities were measured using WAB-K, ANT, and BNT which were considered mid-treatment measurements. Later, the SFA was introduced as the second technique, after

**Table 1** Summary of investigations made before the intervention program

Domains assessed	Tests administered	Scores	Findings
Language	Western Aphasia Battery-Kannada (WAB-K)	WAB AQ-75.2 (SS-7, AVC-9.2, R-5.4, and N-6.8)	Aphasia quotient of 75.2, classified as fluent type of aphasia with poor repetition and better comprehension scoring. Diagnosed with Wernicke's aphasia
	Action naming test (ANT) in Kannada	ANT-94/114	Action naming of 94 suggests poor naming abilities concerning verbs and nouns.
	Boston naming test (BNT) in Kannada	BNT-83/114	BNT scores 83 suggest poor naming abilities concerning verbs and nouns. On observation, it is noticed that verb naming was better compared with noun naming based on scores obtained
Cognition	Montreal Cognitive Assessment in Kannada (MoCA)	22/30	A score of 22 in MoCA suggests mild cognitive impairment present
	Addenbrooke's Cognitive Examination 3 <sup>rd</sup> edition in Kannada -(ACE-III)	63.5/100	A score of 63.5 suggests moderate cognitive impairment
	Sem-back for fruits, vehicles, and common objects using E-prime	Sem back Threshold level 4 Reaction time ranges from 867 to 1726 ms	Sem back Threshold level 4 Reaction time ranges from 867 to 1726 ms
Discourse	DAS	Propositional-21 Nonpropositional-8 Discourse quotient-44	The discourse sample had more correct usage of words, but the coherence was affected
Audiological evaluations	Pure tone audiometry	Hearing sensitivity within normal limits	Normal hearing sensitivity and at risk for processing disorders based on the screening checklist administered
	Immittance	No middle ear pathology	
	Auditory processing disorder checklist	At risk for auditory processing disorder	

Abbreviations: AVC, auditory verbal comprehension; DAC, discourse analysis scale; R, repetition; N, naming; SS, spontaneous speech.

**Fig. 1** Visual representation of the assessment and treatment protocol followed in the study.

completion of the treatment protocol with two techniques (PCA and SFA), post-treatment measures were made (ACE III, WAB-K, ANT, BNT, DQ). Follow-up measures (same as a pre-treatment measure) were considered after 15 days of completion of two treatments. A visual representation of the methodology protocol is given in **Fig. 1**.

## Outcome and Follow-Up

The client was discharged after 20 sessions of therapy. The scores of language (WAB AQ), naming (ANT and BNT), discourse (DQ), and cognition (ACE-III and Sem Back) assessment tools showed improvement from pre-therapy to

post-therapy and follow-up measurements. At the same time, the client reported better auditory processing abilities, with the use of self-cueing strategies (compensatory strategy) and improvement in the scores obtained on APD checklist administration in post-therapy conditions.

The maintenance effect was addressed after 15 days of completion of therapy through follow-up measurements. The scores of all the domains at the time of follow-up measurements were higher compared with baseline and post-therapy measurements. The scores obtained by the client during baseline, post-treatment 1, post-treatment 1 and 2 (treatment 1 followed by treatment 2), and follow-up measurements are depicted in **Table 2**.

**Table 2** Scores obtained on assessment tools on different domains from pretherapy to follow-up

Sl no.	Domains	Outcome variables	Baseline	Post Tx-1 (PCA)	Post Tx- 1 & Tx- 2 (PCA & SFA)	Follow-up
1	Language	WAB AQ	59.1	72	66.3	76.5
2	Naming	ANT	89	97	108	114
		BNT	61	72	68	98
3	Discourse	Propositional	21	18	21	33
		Nonpropositional	8	4	6	3
		DQ	72.8	59.2	78.51	85.18
4	Cognition	ACE-III	58	59	72	86
		4 Sem back—reaction time for accurate response (vehicles)	1726ms	1543ms	541ms	1430ms
		4 Sem back—reaction time For accurate response (fruits)	1510ms	759ms	682ms	488ms
		4 Sem back—reaction time For accurate response (common objects)	867ms	457ms	238ms	987ms

Abbreviations: ACE-III, Addenbrooke's Cognitive Examination—3<sup>rd</sup> version; ANT, action naming test; BNT, the Boston naming test; PCA, phonological component analysis; SFA, semantic feature analysis; WAB-AQ, Western Aphasia Battery-aphasia quotient.

It is observed that, from the raw score at post-treatment 1 (PCA), there was improvement in language (AQ score), naming (ANT score and BNT scores), and cognition (ACE-III scores and reduced reaction time). At post-treatment 2 (PCA-SFA), improvement was seen in naming (ANT scores), discourse (DQ score), and cognition (ACE-III scores and reduced reaction time). At the time of follow-up, the provisional diagnosis of the client changed from Wernicke's aphasia with moderate cognitive impairment with Auditory Processing Disorder (APD) to Conduction aphasia with features of APD.

## Discussion

It is typical to observe language difficulties after a stroke and there are other comorbid conditions, such as auditory processing disorders,<sup>16</sup> poor discourse abilities,<sup>17</sup> and poor cognitive abilities<sup>18</sup> in this case study. The client in this study is young; as a result, a higher recovery rate is anticipated<sup>19</sup> despite the comorbidities associated with aging. In such circumstances, an early intervention program by a speech-language pathologist is a pioneering step toward recovery. The client started speech and language treatment within 3 months of the postmorbid condition,<sup>20</sup> as advised by the neurologist. This enhanced the client's performance within the spontaneous recovery period of communication skills, and his quality of life has improved as self-reported information.<sup>21</sup> The client in this case study did not undergo audiological evaluations at post-treatment 1 and 2, and follow-up levels, leading to no supportive data to discuss the status of auditory processing disorder; however, there was an improvement in the comprehension of simple wh-questions with the help of compensatory strategies.

Intensive language training is a significant contributor to rehabilitation. In PWA, long-term maintenance effects are

followed by brief, intensive therapeutic programs.<sup>22</sup> Similarly, the client of this case study had intense treatment for 20 sessions, each lasting an hour on 5 days a week. This facilitated improvement in language, cognition, and naming skills over time.

Incorporating two or more approaches with different principles (PCA followed by SFA) leads to better improvement when compared with traditional speech and language therapy techniques, which would operate on one principle alone with one component of language alone. A general improvement in language skills is achieved by contrasting two therapy philosophies. This case study used such a sequential treatment approach in the naming treatment for PWA and demonstrated increased overall linguistic ability via WAB AQ scores and DQ. This suggests focusing on sequential techniques (PCA followed by SFA) rather than individual treatment techniques.

Language and cognition are connected and impact one another. Treatment in one area impacts the other.<sup>15,23</sup> This idea was applied to this case study. The client received the name therapy, and the outcomes in terms of naming, overall linguistic abilities, and connected speech influenced the cognitive ability. Thus, all the outcome measures of all the domains in the client showed improvement from baseline to post-treatment 1 and post-treatment 2 and follow-up.

## Conclusion

The PWA who participate in intensive and early intervention programs see significant improvements in their speech and language abilities and consequently, their overall quality of life will be enhanced. In this case study, only naming ability was treated with PCA and SFA techniques, but the overall language abilities including discourse and cognition were

assessed at different levels of the treatment phases. It is observed that the carryover effect is seen between the PCA and SFA techniques. However, the investigator's primary concern was successful in observing the significant effect of naming treatment on linguistic and cognitive domains. The effectiveness of the treatment sequence (SFA followed by PCA) in association with the detailed audiological assessment, language, cognition, and discourse would be recommended for future study.

#### Conflict of Interest

None declared.

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