Chapter

Treatment Approaches for Word Retrieval Deficits in Persons with Aphasia: Recent Advances

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Abstract

Word retrieval deficit is found to be one of the most persistent symptoms reported among the constellation of symptoms exhibited by persons with aphasia (PWAs). This deficit restraints the persons with aphasia to perform with ease across day-to-day conversations. As a consequence, PWAs fail to communicate their desired ideas or thoughts. Word retrieval is an intricate process as it entails various levels of processing. In addition, word retrieval breakdown can occur at multiple levels (semantic level or lexical-semantic level, or phonological level). Thus, there is a need for speech-language pathologists (SLPs) to treat this deficit through effective treatment approaches. In recent decades, semantic feature analysis, verb network strengthening treatment, and phonological component analysis have received greater focus and importance in treating word retrieval deficits. Many studies confirmed that the use of these treatment approaches on PWAs possesses a pivotal role in remediating word retrieval deficits.

Keywords: word retrieval, lexical-semantic strengthening, semantic therapy, phonological therapy

1. Introduction

Word retrieval deficits remain one of the enduring symptoms in most PWAs [1]. Word retrieval deficits are events where the individual exhibits word-finding difficulty in conversation or while conveying their ideas or thoughts. The prevailing literature on word retrieval failures suggests that this deficit varies in their cognitive and neural underpinnings among discrete variants of aphasia. The SLP treating word retrieval deficits firstly needs to understand the nature of word retrieval breakdown (semantic or phonemic). These are ascertained *via* comprehensive naming assessments, and then based on the nature of word retrieval failures, appropriate treatment paradigms need to be employed.

2. Pathophysiology of naming impairments

The word retrieval process is an intricate process requiring two critical stages—semantic and phonologic [2, 3]. The retrieval process is strongly influenced by the modality in which they receive the input. For instance, confrontation picture

naming involves object recognition as the primary input mechanism, followed by activation of the semantic system. The semantic system aids in storing the meaning and has associated information about the activated word. Finally, the semantic system activates modality-specific output lexicons for spoken, written words, and actions. With respect to spoken naming, lexical phonological output systems are activated. Subsequent to semantic and phonologic lexical retrieval stages, the post-lexical and articulatory process aids in the planning and execution of the verbal responses. These complex processes involved in word retrieval are likely to be affected in individuals with brain insult resulting in word retrieval impairment.

The word retrieval breakdown associated with PWAs is mediated by a distributed left hemisphere neural network (Hart & Kraut, 2007). There is a large body of evidence that suggests a lesion in the inferior temporal cortex is responsible for word retrieval impairments. Indeed, these impairments may vary with respect to the grammatical class and the impairments may be more for nouns than for verbs [4–6]. The lexical phonological output is mediated *via* the left superior temporal gyrus and inferior parietal cortex [1]. Lesions noted at the left frontal operculum result in non-fluent forms of aphasia, which result in difficulty in retrieving verbs than nouns [4–6]. Wilshire and Coslett [7] opine that word retrieval impairment can be accredited as an interface between syntactic and lexical processes. As far as the brain structure affected is concerned, the thalamus plays an indispensable role in word retrieval; as a result, lesions at the thalamus result in word retrieval impairment also [8].

3. Treatment approaches

Most of the treatment protocols developed for discrete variants of aphasia address the domains of linguistic deficit in aphasia. This implies that the protocol would be merely beneficial for semantically related deficits or phonological-based deficits. Traditionally, treatment rendered to PWAs relies on a symptomatic approach. Owing to the fact, aphasia is a multifaceted condition and entails the complex nature of the processing, and treatment for PWAs is explained along a continuum of naturalness [9].

One end of the continuum is the participation-based or socially oriented approach that primarily focuses on naturalness. Under this domain, the life participation approach [10] is streamlined as a socially oriented approach. LPAA aids in re-engagement of life to maximize an individual's quality of life and communication skills. The other hand of the continuum is the impaired-based approach. The impaired-based approach works on the premise of enhancing individuals' linguistic abilities. Subsequently, the treatment paradigms related to it were designed with the rationale of obviating the damaged processes.

3.1 Impaired-based approach

Impaired-based word retrieval paradigms are deployed to maximize the word retrieval abilities in contexts of speech and conversation. In the recent past, various types of word retrieval paradigms have been meticulously developed to remediate retrieval deficits. These are some of the seminal word retrieval paradigms, for instance, cueing hierarchy, phonological component analysis (PCA), semantic feature analysis (SFA), and Verb Network Strengthening Treatment (VNeST).

3.2 Cueing hierarchies

In cueing hierarchy paradigm, the SLP renders a series of discrete and potent cues to facilitate the targeted word. When PWAs retrieve the desired target word,

the clinician encourages to repeat the target word several times, or the clinician presents cues in reverse order until the PWA provides the desired response. While using cueing hierarchy in PWAs, SLPs must ensure the more and less effective cues pertaining to the individual. In this paradigm, the targeted word is elicited through both semantic and phonological cues.

However, few studies highlight the potent role of semantics over phonological cues or vice versa (e.g., [11–13]). A review study by Patterson (2001) was carried out to uncover the effectiveness of cueing hierarchy in remediating word retrieval failures. The consolidated reports by various studies posit that cueing hierarchy paradigm aids in showing ameliorated performance for the trained words with various levels of retrieval deficits (semantic or phonological).

There are few interesting studies, which appraised the effectiveness of cueing hierarchy paradigm by inculcating variations in the training. Marshall, Karow, Freed, and Babcock [14] compared the effect of personalized cues (i.e., a phrase developed by the individuals themselves) over phonological cues. The findings computed in the study showed that individuals using personalized semantic information (e.g., "Apple is red in color"? or the animal which eats flesh?) outperformed phonological cues alone. Furthermore, the cueing paradigm was trained and developed through software to provide more flexibility and to reach a large population who are deprived of receiving speech-language therapy services.

Over the recent decades, researchers have used a computerized version of cueing hierarchy paradigm. The finding of the study evinced ameliorated performance for the trained words in moderate–severe naming impaired individuals [15, 16].

3.3 Phonological component analysis (PCA)

PCA is one of the renowned treatment approaches to remediate word retrieval deficits [17]. This approach emphasizes the use of self-cueing. In PCA therapy, individuals are presented with a picture placing at the center of the chart, and then, they are asked to name the corresponding picture. Simultaneously, PWAs are asked to identify the phonological components such as rhyming words, the first sound, first sound associate, final sound, and the number of syllables with respect to the target word (**Figure 1**). While identifying the phonological cues, if individuals fail to produce desired responses, then they are given an array of choices (up to three choices). Out of these choices, individuals need to select one of the choices among three. Choices are presented *via* letter cards, and the clinician reads these choices aloud. The response elicited is noted in the chart. Once the response generation for each phonological component is complete, PWAs are able to retrieve the target item independently. When they generate the desired response, then positive feedback is provided. Considering the possibilities of errors, the clinician models the desired response and needs reiteration by PWAs.

The impact of PCA treatment on word retrieval skills per se has been studied in many research studies. The evidences from these studies seem to be conducive as they manifest ameliorated performance in trained items in most of the studies [18, 19]. On the other hand, the findings for PCA on untrained stimuli seem to be less robust. Thus, researchers posit poor generalization skills following PCA treatment [11, 18].

3.4 Semantic feature analysis (SFA)

3.4.1 SFA for objects

SFA intends to manifest ameliorated performance in lexical retrieval abilities per se in PWAs. This treatment systematically trains the target word by activating the

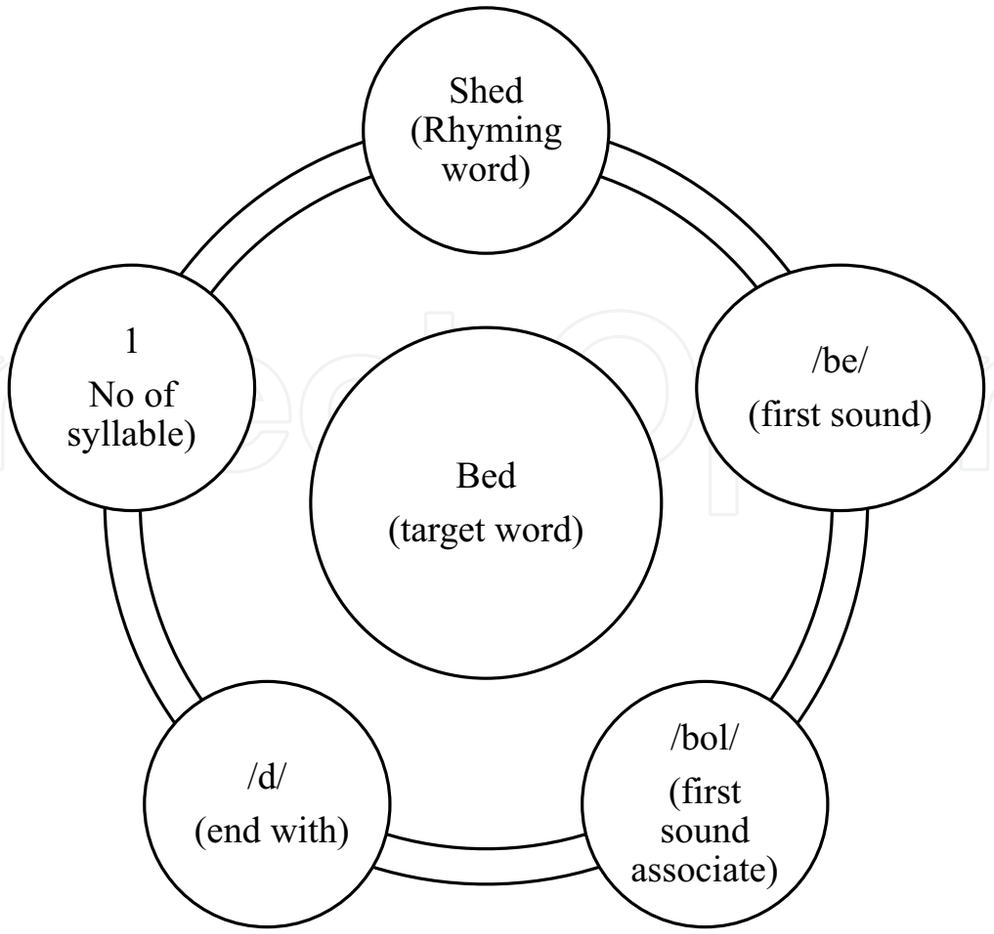

Figure 1.
Flowchart depicting the procedure of phonological component analysis (PCA) treatment.

discrete semantic attributes, enhancing the semantic networks corresponding to the target word. In this treatment, the clinician places a target word picture card in the center of the chart. The chart comprises the discrete semantic features—superordinate category, use, action, physical properties, location, and association of the corresponding target word (**Figure 2**). In short, the clinician initially provides the target picture; subsequently, PWAs will be asked to retrieve the corresponding semantic attributes. If PWAs fail to name, then the clinician cues them to retrieve the desired responses. To provide semantic features, the clinician reads the printed cues and provides the relevant features both orally and in written forms. The semantic feature generation aids in distinguishing desired features versus undesired features of the target word. Initially, SFA training emphasizes maximal cueing by the clinician. Eventually, cueing is faded as the training progresses. The semantic features enhance the activation of the corresponding target word; consequently, PWAs name the items without any cues. If PWAs are not able to retrieve the target item and corresponding features, then the clinician delivers the name and features [20].

3.4.2 SFA for verbs

Semantic feature analysis treatment for verbs follows a slightly distinct protocol compared to noun training. In this treatment, a picture of the target action will be placed at the center of the chart. The PWA will be asked to retrieve the corresponding action. If they fail, the clinician cues the action verb using the following semantic features—(a) the agent/experiencer of the action ("Who usually does

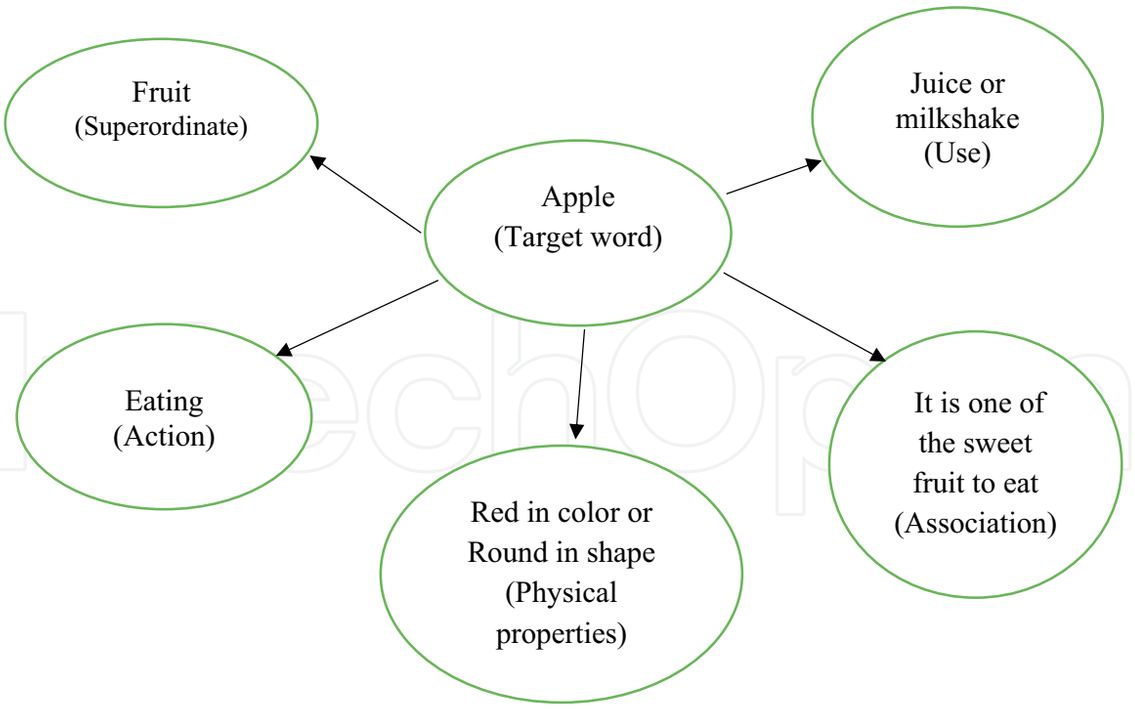

Figure 2.
Flowchart depicting SFA treatment for noun.

this?"), the theme/patient ("On what/ by whom is it performed?"), the location ("Where does this action happen?"), the purpose of the action ("Why does this happen?"), the means of carrying out the action ("What part of the body or what tool is used to make this happen?"), and the related objects or actions that reminded the participant of the target verb ("What does it make you think of?"). These features were introduced one at a time and in the same order mentioned above. The PWA's response will be noted down. If the PWA failed to provide the desired response, then the clinician prompts a response. The prompts can be either semantic or phonological. After generating all six semantic features, the PWAs are asked to name the target action without any prompts. Despite these prompts, if the PWA still fails to arrive at desired responses, then the clinician delivers the target action word. The PWA is asked to repeat the action word after the clinician models. Finally, they will be asked to construct a simple sentence using the verb; if they are unable to produce, then the clinician assists in constructing simple sentences or narrating the simple sentences for PWAs. The PWA is prompted to repeat after the clinician narrates the sentence (**Figure 3**).

Further, to document SFA treatment findings across various studies, a systematic review was conducted [21]. This review study pooled data from 21 studies consisting of 55 PWAs encompassed both fluent and nonfluent variants of aphasia. The findings revealed robust findings for 45 out of 55 PWAs for the trained items; 32 out of 55 PWAs were able to maintain the responses. In addition, 40% of PWAs were able to manifest generalization of response to the untrained stimuli. The SFA treatment manifested robust outcomes for fluent and mild–moderate severity of aphasia compared to nonfluent and severe forms of aphasia [22–25]. Overall, SFA is deemed as a viable treatment approach in the diminution of word retrieval deficits. In light of these findings, future studies on SFA should focus on observing or noting the generalization on untrained stimuli. A future implication would be that the treatment approach can be extended by documenting the improvement in the discourse genre.

Figure 3.
Flowchart depicting SFA treatment for verbs.

3.5 Verb network strengthening treatment (VNeST)

VNeST was developed on the premise that if treatment paradigms utilized verbs as the core element then it can aid in the activation of a wide array of semantic networks. In addition, it may assist in the construction of simple active sentences. VNeST protocol constitutes a total of six steps to remediate word retrieval deficits [26]. These steps are as follows:

1. *Step one—Generation of Verb, Agent, and Patient*: In this step, the clinician probes PWAs to retrieve the verb with the relevant semantic cues. If they are unable to retrieve the target verb, then maximal cueing is provided. Subsequently, PWA will be probed to elicit relevant agents (doer of the action) and patients (receiver of the action) for the intended verb. If PWA fails to elicit the corresponding agent and patient pairs on their own, then they will be provided with a series of choices (maximum cues).

   To illustrate, to retrieve the verb "Baking," the following semantic cues can be used: (a) This is usually done in the kitchen; (b) this is usually done using utensils/stove; (c) this is usually done to prepare bread, cake. For identification of the corresponding agent for the verb "Bake," individuals will be provided with choices (written cards) of photographer, farmer, and chef. PWA will be asked to identify the corresponding agent for the verb "Bake." Eventually, a similar cueing strategy will be carried out for the identification of the patient. In addition, PWA will be encouraged to produce agents and patients from their experiences. The rationale of step one is that eliciting a wide array of agent/patient pairs may promote the activation of discrete semantic networks corresponding to the verb.

2. *Step two—Reading the Agent/ Patient Pairs*: In this step, the PWA is prompted to read the generated agent/patient pairs corresponding verb. If they fail to read the simple sentence, then the choral reading strategy is employed.

3. *Step three—Response to Wh Questions:* The clinician intends to expand the generated agent/patient pairs in this step. That is, PWA is probed with series of "Wh" questions related to the pairs. However, this expansion is confounded to only one pair of agents/patients.

4. *Step four —Judgment*: This step is focused on carrying out sentence judgment by the varying agent or patient order. Four combinations of sentences will be presented/read to the PWA—(a) inappropriate agent form (doctor baked cake), (b) inappropriate patient form (chef baked tree), (c) sentence reversal (cake baked chef), and (d) the appropriate form (chef baked cake). The PWA has to judge where each sentence is correct or incorrect. Both steps *three* and *four* focus on strengthening the relationship among the verbs and their corresponding agent/patient pairs.

5. *Step five—Independent Retrieval of Verb:* In this step, the PWA has to retrieve the verb without any cues. If they are unable to retrieve, then prompts are provided.

6. *Step six—Independent Retrieval of Agent/Patient:* This step intends to elicit agent/patient pair for the target verb independently. Here, no prompts or cues will be rendered. This step aids in strengthening the discussed pairs before moving into the successive trained stimuli.

The relevance of steps with respect to the activation system occurring in the VNeST protocol is depicted in **Figure 4**.

In order to understand the effectiveness of VNeST treatment, Edmonds [27] conducted a review study. A total of 19 English-speaking PWAs received VNeST treatment across different studies [26, 28–30]. These studies enrolled PWAs who evinced chronic aphasia with severity ranging between mild and severe form; PWAs showed no impairment or moderate impairment in cognitive-linguistic quick test and had good comprehension scores. Ten verbs were trained. The PWAs enrolled in these studies were trained for 4–15 weeks, twice a week (each session would last for 3–3.5 hours), wherein the majority of PWAs received training for 10 weeks on an average. On the other hand, Furnas and Edmonds [29] provided training thrice a week, with each session would last for 2 hours per session for the time interval

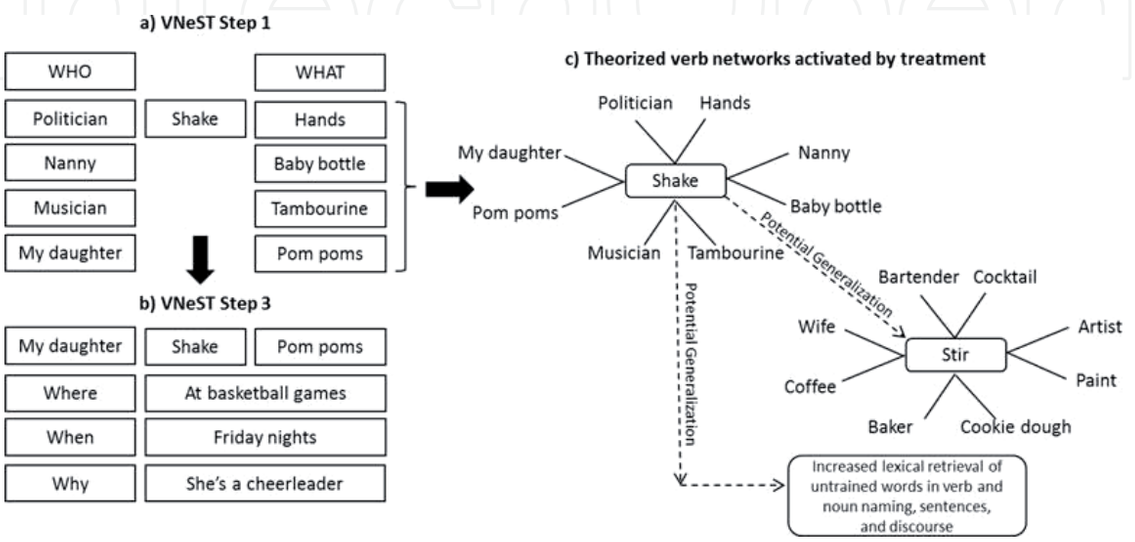

Figure 4.
Activation of the semantic network using VNeST treatment protocol. Edmonds [27].

of six weeks. Outcomes of this review study served as the preliminary evidence. These studies posit that VNeST training reinforces lexical retrieval at a single word, sentence, and discourse genre across discrete variants of aphasia and with different levels of severity.

In addition, these studies evinced improvement in functional communication, per se. The studies based on VNeST showed ameliorated performance in noun and verb naming, sentence production, and discourse genre across the trained and untrained conditions. Despite these prominent findings, more research is warranted to strengthen these findings. The majority of the studies showed mixed findings while gauging the generalization effect. Equivocal findings were also noted across fluent and nonfluent aphasia and across different levels of severity. These literatures failed to evince the specific pattern or mechanism responsible for showing improvement in specific types of aphasia. Thus, the VNeST training has to be assessed in detail for each type of aphasia.

4. Conclusions

This chapter focuses on some of the word retrieval treatment approaches. These approaches are mainly intended to ameliorate word representation and also to activate the phonological encoding stage of word retrieval. While gauging the effectiveness of any treatment approach, several factors are to be looked upon, namely—(1) maintenance of word retrieval skills per se followed by therapy; (2) response generalization to the untrained conditions and different treatment settings. The treatments discussed in this chapter discerned fairly good generalization and response maintenance in almost all the approaches. However, relatively poor generalization skills are noted in the PCA. Poor responses can be attributed to being surface-level training and redundancy of cues. In cases of more severe word retrieval deficits, the treatment paradigms discussed may not be suitable for the initial phase of treatment. Instead, the clinician must start the treatment with more direct facilitative treatment and gradually progress to the treatment that entails self-generation of words. Owing to this, speech-language pathologists should consider severity before selecting the specific word retrieval treatment.

Commonly raised concern in the treatment-related studies is the superiority of one treatment approach over the other or anyone specific treatment approach is engendered to show maximal benefits. The answers to these questions are still at preliminary levels, and these need to be documented by conducting various research on these lines. To our understanding, in the current scenario, no particular treatment approach is deemed as superior over other treatment approaches at a more advanced level. However, based on the prevailing evidence, the VNeST approach can be claimed as the streamlined approach compared to SFA and PCA at the surface level in remediating word retrieval deficits.

Word retrieval treatments needed to be selected meticulously, and their impact on functional communication needs to be looked into, as word retrieval deficits are engendered to evince a tremendous impact on the day-to-day conversation. In some word retrieval treatments, improvement may be confounded to trained conditions, or improvement may be generalized to few untrained conditions. Owing to this, treatment paradigms selected should include strategies that would aid the PWAs to show improvement even in the functional communication per se.

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