



Impact of Semantic Cueing of Verb and Its Thematic Role on Discourse Skills of Persons with Aphasia

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Abstract

Introduction Understanding the relationship between word retrieval treatment and discourse skills is deemed pivotal, as it gives the individuals a more naturalistic linguistic performance.

Objective The aim of this study was to unravel the impact of word retrieval treatment on discourse skills.

Method and Materials Semantic cueing of verbs and its thematic role (SCVTr) treatment were rendered to 11 persons with aphasia (PWAs). Subsequent to therapy, discourse skills were evaluated in the pretreatment, midtreatment, posttreatment, and follow-up phases using both qualitative (discourse analysis scale) and quantitative (T-unit analysis) measures. The follow-up phase in the study began after 1 month of cessation of treatment.

Results The outcome of the study evinced statistical differences in the discourse skills in both qualitative and quantitative measures of discourse between pre-, mid-, and posttreatment phases. However, no statistical difference was found between the posttreatment and follow-up phases across qualitative and quantitative measures. This signifies there are no differences in discourse skills after the cessation of treatment.

Conclusion The study findings seemed to be novel, as the study explored the impact of word retrieval treatment on discourse skills. It also sheds light on the importance of discourse analysis and the ways of measuring it in PWAs. Overall, the study finding seems conducive as it posits positive outcomes in both qualitative and quantitative measures of discourse skills following word retrieval treatment.

Keywords

- ▶ word retrieval
- ▶ discourse
- ▶ semantic treatment
- ▶ anomia

Introduction

Word retrieval deficit has a detrimental effect on communication in most of the persons with aphasia (PWAs). These deficits are treated through various treatment approaches, for example, semantic feature analysis (SFA), phonological

component analysis (PCA), verb network strengthening treatment (VNeST), and treatment of underlying forms (TUF).¹⁻⁴ Out of these approaches, VNeST stands out to be one of the most effective treatment paradigms.³

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The VNeST paradigm was designed to facilitate generalization to the untrained sentences and to distinct discourse genre. The rudimentary premise of VNeST lies around semantic verb networks, which comprise verbs and their corresponding thematic roles. For example, consider the verb “drive”; this activates the corresponding thematic roles “dad” and “car.” The activation depends on the experience and the world knowledge of PWAs.⁵ This treatment approach invariably facilitates these multiple networks associated with the verbs, which may strengthen and/or reroute the damaged connections.

Outcomes noted from VNeST studies support the premise that systematically activating verbs and their corresponding thematic roles bolsters the performance of untrained nouns and verbs at the sentence level and in different discourse genres.^{1,6–8} The degree of generalization noted in VNeST studies is generally higher relative to the other aphasia treatments, which have primarily focused on improving sentence structure, syntax, and morphosyntax.^{1,3,8} The treatment approaches that are conceptually akin to VNeST have empirically tested the semantic relationship between verbs and their thematic roles. The study findings ascertained modest generalization to the untrained contexts, particularly for the connected speech.^{4,9,10}

Deepak and Goswami⁷ conducted a case study based on the principle of VNeST treatment in the Indian scenario named semantic cueing of verb and its thematic role (SCVTr). The outcomes of the study manifested ameliorated performance in both trained and untrained stimuli. In addition, an improvement was noted in the qualitative measures of discourse. However, the study findings should be applied conservatively as the study outcomes were based on the case studies. Also, the researchers utilized only the qualitative measure for assessing discourse; this may hinder the researchers in noting the extent of word retrieval improvement in PWAs.

Understanding the relationship between word retrieval treatment and discourse skills is deemed pivotal, as discourse promotes an individual’s naturalistic linguistic performance.¹¹ Discourse tasks are assumed to pose a higher communicative load relative to other language tasks (confrontation naming, comprehension, etc.). The higher communicative load may be attributed to the integration of both linguistic and nonlinguistic abilities.^{12,13}

On the other hand, some researchers posit that discourse measures are less constrained than confrontation-naming tasks,¹¹ wherein discourse measures have flexibility in producing a wide range of words, which contributes flexibility for individuals during the description of stories or pictures. In the confrontation-naming task, individuals need to retrieve the items’ desired name.¹¹ Despite understanding the potency of discourse, many treatment studies fail to gauge the relationship between word retrieval treatment and discourse. Previous studies on word retrieval treatment confounded their assessment merely to note improvement in word retrieval skills per se.^{12,14,15}

However, some studies have assessed the impact of word retrieval treatment on discourse skills, but there are a limited number of such studies.^{1,4} In addition, assessing the gains

computed on the discourse skills following word retrieval intervention is deemed imperative. Owing to the fact that discourse is the most important means of communication in daily day-to-day conversation, the treatments that manifest the generalization of response to the discourse genre are deemed potent. Accomplishing generalization becomes the key goal in any of the word retrieval intervention approaches of aphasia.¹⁶ Hence, the current study investigated the influence of word retrieval treatment on discourse skills across pre-, mid-, and posttreatment phases; we also investigated the effect of word retrieval treatment following treatment cessation.

Methods and Materials

Participants

Eleven PWAs (fluent and nonfluent aphasia) with an average age of 38.72 years (range: 24–64 years; standard deviation [SD] = 11.97) were enrolled in the study. These participants were selected via a convenient sampling method in the Mysuru district, India. Furthermore, the study was approved based on the “Ethical Guidelines of Bio-Behavioral Research Involving Human Subjects”¹⁶ and approved by the Ethical Committee at the All India Institute of Speech and Hearing, Mysuru (WF-179/2018-19). These participants were enrolled in the study after meeting several inclusion criteria: (1) diagnosis of aphasia confirmed based on the Western Aphasia Battery in Kannada (WAB-K)¹⁷; (2) native Kannada speakers; (3) right-handedness premorbid to stroke; (4) negative history of a learning disorder or drug or alcohol addiction; (5) minimum of 50% scores in the auditory-verbal comprehension section; (6) no impairment in cognition, confirmed via the Mini-Mental State Examination (MMSE)¹⁸; and (7) no sign of apraxia, confirmed through the administration of an apraxia section of the WAB-K (see **►Supplementary Table S1**, available in the online version only, for demographic details of the participants).

Variables Considered in the Study

In the current study, discourse parameters such as number of T-units, number of words per T-unit, number of clauses, number of words per clause, and discourse quotient were considered as the dependent variable, whereas the SCVTr therapy was considered the independent variable of the study.

The WAB-K and discourse analysis scale (DAS)¹⁹ materials were used in the study. The WAB-K was administered by a qualified speech-language pathologist (minimum of 5 years of experience) to assess for the presence of aphasia and to categorize the individuals as fluent or nonfluent aphasia. The DAS was used to assess discourse skills qualitatively for picture description, narration, and conversation tasks. In addition, quantitative measures were computed based on T-unit analysis using a picture description, narration, and conversation tasks.

Procedure

The current study employed a “modified pretest–posttest design” to analyze the outcome. At the outset, the participants enrolled in the study were subjected to the SCVTr

treatment. The SCVTr treatment is conceptually similar to VNeST treatment. In this study, the term SCVTr is used instead of VNeST.

The treatment was delivered 3 days a week, for about 60 to 80 minutes per session (see **Appendix 1**, available in the online version only). Improvement was noted for word retrieval skills per se following the SCVTr therapy as phase 1 study.⁷ In this study, the researchers' specific aim was to track down the improvement in discourse genre following the SCVTr treatment. The DAS was employed to evaluate the discourse skills in PWAs through the picture description task, narration task, and conversation task. In the picture description task, pictures of "broken window," "refused umbrella," and "cat rescue" were utilized as the picture stimuli. In the narration task, PWAs were asked to narrate a story of their interest. In the conversation task, PWAs were asked questions about general topics. In all these tasks, the propositional and nonpropositional aspects of communication were evaluated. After recording the responses, the scores of each task were consolidated to derive the discourse quotient (DQ) for each task based on qualitative analysis as per the manual. The scores at the final stage were converted to percentile. All the parameters aforementioned were rated perceptually using a 3-point rating scale, where "0" indicates a poor response, "1" indicates a fair response, and "2" indicates a good response.

To illustrate the qualitative analysis of discourse, if a PWA scored 42/58 in the propositional aspect and 5/20 in the nonpropositional aspect in the conversation task, then the DQ for the conversation task would be 60.25% ($42/58, 5/20 = 47/78 \times 100 = 60.25\%$).

With respect to T-unit analysis, the basic unit for segmenting the data was the T-unit; it is delineated as one independent clause with dependent modifiers of that clause.²⁰ The clause can be further classified as independent (main clauses) and dependent (subordinate) clauses. A main or independent clause is deemed a complete sentence. It entails a subject and a verb, and thus expresses a complete thought in both context and meaning. The dependent (subordinate) clause is just a part of the sentence. It necessitates a subject and a verb, but does not express a complete thought. They can make sense on their own, but they are dependent on the rest of the sentence for context and meaning.

The discourse tasks in the study were quantitatively analyzed in terms of grammatical units of discourse. The analysis included a number of T-units (NTU), number of words per T-unit (NWPTU), number of clauses (NC), and number of words per clause (NWPC). These parameters were analyzed to differentiate between thematic level and sentential level deficits.

During a T-unit analysis, errors such as neologistic paraphasias, interjections, and word repetitions (more than one repetition) were excluded. To illustrate the T-unit analysis, consider the sentence taken from the discourse sample of the study: /avanu mara hathira ninntida/mele ondu bekku iththu aa bekku kaapadalu mara mele haththida amele ondu dodda eeni tanda, aa jagakee ondu naei banthu/. The T-unit analysis for this sentence would be as follows: NTU—2; NWPTU—12 (24/2); NC—5; and NWPC—4.8(24/5).

Further, the computed data for qualitative and quantitative measures of discourse were subjected to a visual inspection method based on the Kratochwill et al.²¹ protocol. This protocol elucidates the data based on (1) level, (2) trend, (3) immediacy, and (4) consistency. These parameters are explained in detail in the "Results" section of the study.

Results

The data computed via the qualitative and quantitative methods for discourse analysis were fed into Statistical Package for Social Science (SPSS) Version 26.1 (SPSS Inc., Chicago, IL, United States). Initially, data were subjected to a normality check using the Shapiro–Wilk test. The analysis showed normal distribution of scores ($p > 0.05$) for the qualitative measure (DAS scale) of discourse. On the other hand, data computed for quantitative measures (T-unit analysis) showed a non-normal distribution ($p < 0.05$). The visual inspection method adapted in the present study followed a slightly distinct procedure compared to the original protocol. This modification was incorporated in order to suit the experimental paradigm of the current study.

Level: The level of the participant is elucidated based on the baseline performance. A score of greater than 40% was deemed as a high baseline score and a score of less than 40% was deemed as a low baseline score. This categorization is a modification to the original protocol.

Trend: It is a phenomenon where the direction of change in a particular data pattern is observed. The obtained data can be increasing or decreasing, or stable compared to their corresponding baseline performances.

Immediacy: It is measured by comparing the baseline data points with the midtreatment data points. Consistency is measured by documenting changes in the posttreatment phase versus the follow-up phase.

On analyzing research questions 1 and 2, the qualitative scores on these measures manifested substantial gains across the pre-, mid-, and posttreatment phases for all the PWAs (see **►Figs. 1 and 2**). Furthermore, data computed in the follow-up phase discerned a good maintenance effect for most of the participants, except participant P6. The data obtained for participant P6 evinced minimal increment in scores from the posttreatment phase to the follow-up phase, thus indicating a modest maintenance effect (see **►Fig. 1**). Overall, the results manifested for qualitative analysis of discourse showed the SCVTr treatment manifested a positive impact on the discourse skills on all participants in the study.

Group data for qualitative analysis of discourse showed pronounced gains from the pre- and midtreatment phase to the posttreatment phase in all the participants. In addition, the mean scores obtained during the follow-up phase were akin to the posttreatment phase. This signifies a good maintenance effect (see **►Table 1**). To ascertain the statistical differences across the treatment phases, one-way repeated measure analysis of variance (ANOVA) was performed. The results revealed a significant effect on the phases of treatment ($F(3, 30) = 139.52, p < 0.05$) with large effect size $\eta_p^2 = 0.93$. Post hoc test using Bonferroni correction revealed

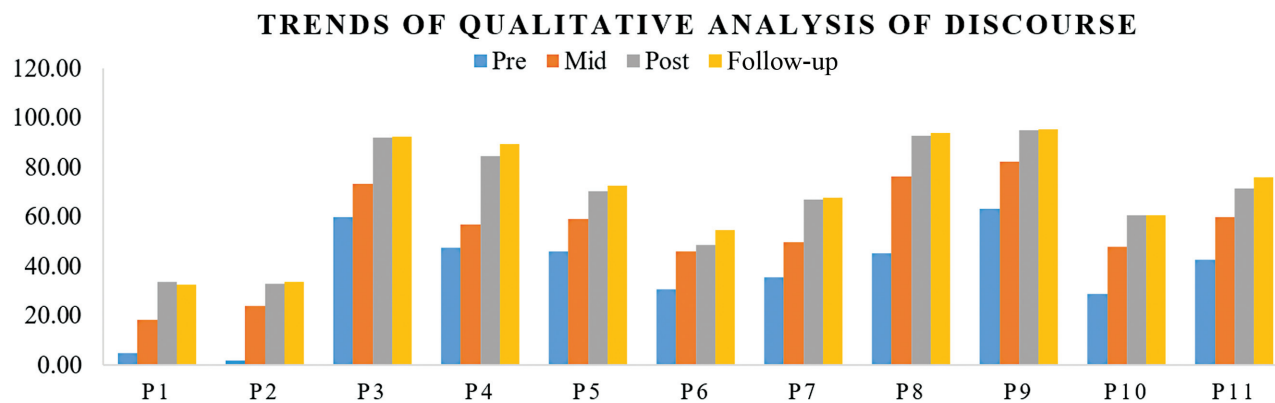


Fig. 1 Trends of qualitative measures of discourse skills across the treatment phases.

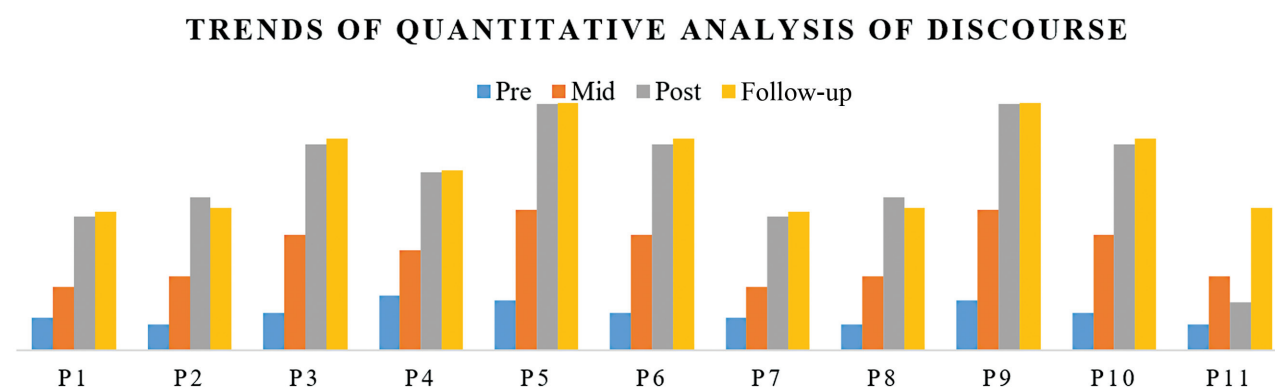


Fig. 2 Trends of quantitative measure of discourse skills across the treatment phase.

Table 1 Mean and standard deviation for the qualitative measure of discourse across different treatment phases

Phases	Mean	SD
Pretreatment	36.75	19.71
Midtreatment	53.76	20.06
Posttreatment	67.93	22.49
Follow-up	69.80	22.75

Abbreviation: SD, standard deviation.

a significant difference between the pre- and mid-treatment phases ($p < 0.01$), mid- and posttreatment phases ($p < 0.01$), and pre- and posttreatment phases ($p < 0.01$). Subsequently, the scores obtained in the posttreatment phase were compared with those of the follow-up phase to ascertain the maintenance effect, and the results revealed no significant differences across the phases ($p > 0.01$), indicating a good maintenance effect.

Quantitative measures of discourse skills evinced that all participants in the study had marked improvement from the pre- to mid- to posttreatment phases. Further, the scores noted in the posttreatment phase were maintained in the follow-up phase, which signifies a good maintenance effect (see ►Supplementary Table S2).

The group mean data on a quantitative measure of discourse showed increased scores for discourse parameters such as the NTU in the pretreatment phase ($M = 6.09$, $SD = 2.34$), midtreatment phase ($M = 11.54$, $SD = 3.77$), and posttreatment phase ($M = 3.51$, $SD = 15.63$). Similar trend of results was evinced for the NWPTU in the pretreatment phase ($M = 34.81$, $SD = 10.56$), midtreatment phase ($M = 110$, $SD = 33.98$), and posttreatment phase ($M = 220.63$, $SD = 49.05$); NC in the pretreatment phase ($M = 10.81$, $SD = 3.48$), mid-treatment phase ($M = 16$, $SD = 5.75$), and posttreatment phase ($M = 24.09$, $SD = 8.50$); NWPC in the pretreatment phase ($M = 10.18$, $SD = 4.01$), midtreatment phase ($M = 13.42$, $SD = 5.89$), and posttreatment phase ($M = 14.54$, $SD = 4.34$).

In addition, the follow-up scores were maintained from the posttreatment phase to the follow-up phase across the discourse parameters NTU ($M = 4.74$, $SD = 15.72$), NWPTU ($M = 221.72$, $SD = 53.73$), NC ($M = 24.09$, $SD = 9.37$), and NWPC ($M = 12.63$, $SD = 3.85$).

Further, one-way repeated measure ANOVA was performed across the different phases of treatment. The outcomes computed from the data revealed significant differences across different phases of treatment ($F(3, 30) = 26.51$, $p < 0.01$) with a large effect size $\eta^2_p = 0.93$. Further, to see the pairwise difference, a post hoc test using Bonferroni's correction was performed. The results revealed a

Table 2 Results of pairwise comparison for quantitative measure of discourse measures across the treatment phases

Phases	N = 11			
	p			
	NTU	NWPTU	NC	NWPC
Pre- vs. midtreatment	< 0.01*	< 0.01*	< 0.01*	< 0.01*
Mid- vs. posttreatment	< 0.01*	< 0.01*	< 0.01*	< 0.01*
Pre- vs. posttreatment	< 0.01*	< 0.01*	< 0.01*	< 0.01*
Posttreatment vs. follow-up	> 0.01	> 0.01	> 0.01	> 0.01

Abbreviations: NC, number of clauses; NTU, number of T-units; NWPC, number of words per clause; NWPTU, number of words per T-unit.
*denotes significance differences

significant difference between the pre- and midtreatment phases, mid- and posttreatment phases, and the pre- and posttreatment phases. However, there was no statistical difference between the posttreatment and follow-up phases, indicating a good maintenance effect (see ►Table 2).

Visual Inspection Method

Level: The level analysis of qualitative and quantitative measures of discourse depicted high- and low-level baseline scores by the participants (see ►Fig. 1).

Trend: On vetting the trends of participants on qualitative and quantitative measures of discourse, an increasing trend of performance across the treatment phases was noted. Similar trends were also noted during the measurement of immediacy and consistency effect (see ►Figs. 1 and 2).

Discussion

On addressing research questions 1 and 2, the outcomes noted for qualitative analysis of discourse on the group and individual data evinced a marked increase in performance on discourse skills across the pre-, mid-, and posttreatment phases. Furthermore, an analysis of the maintenance effect for the group and individual data showed no dropout of scores across the posttreatment and follow-up phases for the majority of the participants. On the contrary, participant P6 evinced a modest maintenance effect on individual analysis. Quantitative analysis of discourse also showed an increasing trend of performance from the pre- to mid- to posttreatment phases. The findings of the study showed positive relationship between SCVTr treatment and discourse production. The improvement in discourse skills can be attributed primarily to the use of the SCVTr protocol. This protocol promotes the generation of a diverse array of thematic roles corresponding to the target verb. The generated thematic role and verb were encouraged to produce in the canonical order (agent-patient-verb). The generation of sentences in this fashion not only facilitates the semantic representation of thematic roles and verbs but also strengthens the predicate-argument structure (PAS) and the basic syntax construction.^{1,3,5}

This generation of multiple pairs of thematic role from the participants "world knowledge" contributes to maintaining the response even in the follow-up phase. In step 1 of the

current study, the semantic relationship of the verbs and their corresponding thematic roles have the potential to encourage improvement in both sentence production and discourse. In addition, step 3 of the SCVTr deals with probing discrete "Wh" questions around the generated agent/patient pairs, which may also aid in improving sentence construction abilities in PWAs. Thus, these entities are considered potential mechanisms to mediate changes in the discourse genre. However, findings noted in Edmonds et al¹ showed a varied performance in the discourse skills. Of the four enrolled participants, three showed improvements in discourse skills, but one participant failed to show any improvement. This lack of improvement was attributed to an impairment in the overall sentence construction ability discerned at the baseline assessment.

Conclusion

Understanding the effect of word retrieval treatment on discourse seems imperative as the role of discourse in daily conversation has a significant effect on a person's communication skills. The results of the study can serve as evidence to posit that systematic word retrieval training using the S + V + O (subject + verb + object) canonical order facilitates good sentence structure skills. Thus, PWAs might show a positive result in the discourse skills per se.

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Conflict of Interest

None declared.

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