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Novice Item Generalisation in persons with Anomic Aphasia: Comparison across two treatment techniques

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Abstract

Background: Lexical semantic breakdown leads to difficulty in naming and the lexical semantic breakdown can occur due conceptual deficits, failure in lemma node activation or faulty phonological decoding, the techniques used in remediating lexical semantic breakdown should consider the loci of lexical semantic breakdown. As the person with aphasia uses these techniques, the person learns in exercising associations and this associations would further help in remediating lexical-semantic breakdown.

Aim: The study investigated untrained item generalisation in persons with aphasia exposed to Semantic feature analysis (SFA) and Phonological component analysis (PCA)

Materials and Methods: 10 participants with anomic aphasia were considered for the study and the participants were divided into two groups of 5 each. The first group was trained using SFA and the second group was trained using PCA. The training was carried using 260 pictures naming test and post-training, the novel/untrained generalisation was assessed using Boston Naming Test.

Results: Group exposed to SFA performed better compared to the other group exposed to PCA and the difference in the median values showed statistically significant difference on Man-Whitney U test and the results signified the salience of strengthening the semantic network, which further would facilitate association and related word learning

Conclusion: The two techniques had differential effects on the performance, hence the clinicians using these two techniques should choose the techniques wisely and based on the deficit exhibited the patients regardless of the diagnosis.

Keywords: Lexical Semantic Breakdown, lexical access, Retrieval Failure, Differential Effects, Clinical Discretion

Introduction

Aphasia is a language disorder caused due to the insult to brain and can have a sudden onset [1]., when it is associated with conditions such as stroke, it can have a gradual onset when it is associated with conditions such as tumours. Numerous classifications of aphasia has been proposed till date, dichotomously aphasia can

be classified as fluent and non-fluent aphasia. People affected with fluent aphasia would manifest a marked difficulty in their comprehension skills, their expression would be spared relatively. However their verbal output is meaningless in nature. Non fluent aphasia on the other hand is characterised with effortful verbal output with relatively good comprehension skills. This classification is generic in nature and each of these variants have sub types based on the affected domains and severity of the problem [2].

Naming difficulty or anomia is a common linguistic deficit seen in both the variants of aphasia, in other words naming difficulties can be seen in aphasia regardless of the type of aphasia [3]. This naming difficulty can be attributed to lexical access breakdown. Lexical access refers to the retrieval of the most appropriate word in the lexicon and would involve steps such as conceptual activation, lemma node activation and phoneme retrieval [4, 5]. Conceptual activation refers to the activation of the conceptual features based on the target, based on the conceptual features activated lemma nodes would be shortlisted and this would further trigger the activation of phonemic segments from the phonological output lexicon. A person with fluent aphasia can have a lexical retrieval failure due to conceptual deficits (ex in Wernicke's aphasia) or due to difficulty in lemma node activation (ex in Anomic aphasia), while persons with non-fluent aphasia can experience lexical semantic breakdown due to faulty selection of phonemes from phonological output lexicon or the failure in translating the phonemes to sounds, during the process of articulation. As the current paper involved persons with Anomic Aphasia, it is note-worthy to mention that persons with anomic aphasia would have deficits in lemma node activation as the appropriate lexical node may not be activated or in other words lexical nodes may face competition from the unrelated or lexical nodes/word may offer competition in activation [6,7,8]..

Many techniques are designed to remediate word-finding difficulties seen in Anomic Aphasia. Semantic Feature Analysis (SFA) and Phonemic Component Analysis (PCA) are the most common techniques used for treating word-finding difficulty. SFA is effective when there is lemma node activation failure ([8]. PCA on the other hand is effective when there is a failure in retrieving the phonemic segments from the phonological output lexicon [9,10].The cited studies have tested pre- and post-scores on confrontation naming for estimating the efficacy of treatment. The current study assessed the efficacy of these therapy techniques by testing the performance on confrontation naming test with untrained items. The current study was carried out with the aim of comparing the performance of two groups of persons with anomic aphasia exposed to SFA and PCA respectively.

Materials and Methods

Participants: The current study was carried out a premiere institute of Speech at Hearing at Karnataka, India.

Ten persons with anomic aphasia in the age range of 45-62 years with an average post-stroke duration of 14 months served as participants. Stroke was the cause of Aphasia in all the 10 cases and the participants were stroke survivors. The participants had different type of aphasia at the onset of stroke and recovered to anomic aphasia in the aforementioned time period (14 months). All participants were males in this case and were native Kannada. Western Aphasia Battery (a diagnostic test for aphasia) was administered on the participants and the cases were diagnosed to have anomic aphasia (a mild form of aphasia, with marked difficulty in naming skills)

The participants were divided into two groups of 5 participants each. The first group was trained using SFA and 20 sessions of therapy were imparted and the second group was trained using PCA for 20 sessions. In SFA-based treatment, the individuals were trained to establish semantic relationships while the PCA treatment focussed on activating the phonological components related to the target word.

Materials: The items used for the treatment were borrowed from 260 picture naming test. Following the course of therapy, Boston Naming Test (Sunil & Shyamala, 2009) was administered, and items used in the test were novel items. Care was taken to exclude the items used in the former naming test used in training. The version of BNT used for testing comprised of 40 target items. It is noteworthy that all the items were novel items. These novel items were presented to the participants of the two groups.

Procedure: The participants were asked to retrieve the names of proper nouns and no cues were given to the participant during the assessment session, self-cuing was allowed and no time constraint was imposed for eliciting the responses. The average time for the completion of the task ranged from 15-20 minutes.

Scoring and analysis: A correct response was given a score of 1, while an incorrect response and no response was given a score of 0. The response was considered as correct even when there was a minor articulation error. Thus the maximum score wwas 40 (accounting to 40 stimulus used in the test.

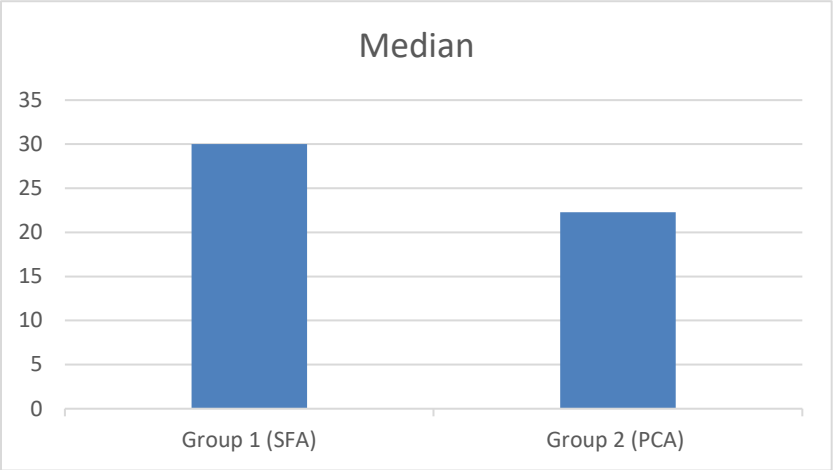
Results

The group exposed to SFA, designated as group 1 secured a score of 31, and the group exposed to PCA, designated as group 2 scored 30. The median scores were 30 and 22.3 for the two groups respectively (as illustrated in figure 1 and table 1). The interquartile range was slightly more for group 1 compared to group 2. The data was subjected to test of normality using Shapiro-Wilks's test of normality and p value obtained was less than 0.05 showing that the data was non-parametric, hence Mann-Whitney U test was used for comparing the performance across the two groups.

Table 1: Mean scores of both the group

	Mean	Median	IQR
Group 1 (SFA)	31	30	4.2
Group 2 (PCA)	30	22.3	3.9

Figure 1 Shows comparison of Group 1 vs Group 2



To verify if there was any significant difference between the two groups, Mann-Whitney U test was used (as the data did not abide by the properties of normal distribution). The Z score on Mann-Whitney U test secured a Z score of 2.34. The corresponding p-value showed a significant difference showing that the group exposed to SFA resulted in better item generalization. Results showed that both treatment techniques were effective as far as untrained item generalization is concerned.

Discussion

The study was carried out with the aim of investigating the untrained item generalisation in persons with anomic aphasia. Persons with anomic aphasia have marked difficulty in retrieving the words and this anomia is attributed to lexical semantic breakdown in general and lemma node retrieval failure in specific and this can manifest in errors such as paraphasia, which is evident in persons with anomic aphasia especially. Techniques such as Semantic feature analysis and Phoneme component analysis are used to remediate the lexical semantic breakdown in aphasia [9]

The Semantic feature analysis (SFA) strengthens the semantic network around the target word while the technique phonological component analysis (PCA) facilitates the phoneme retrieval from the phonological output lexicon and thereby channelizing the retrieval of the word [8,9]. Hence the theoretical underpinning for the two techniques are different however the commonality of the two techniques lies in the fact that both

these techniques remediates the lexical retrieval failure in persons with anomic aphasia.

In the current study, 10 persons with anomic aphasia were considered and they were divided into two groups on random basis, one group was treated with SFA while the other group was treated using PCA, the groups were mutually exclusive. The stimulus for training was derived from 260 stimulus naming test, untreated item generalisation was tested using BNT. It was ensured that the untrained items were used for testing and the two tests did not share any commonalities between them.

It was evident that the group which was treated using SFA performed better on the untrained items compared to the group treated with PCA and the median values on the untrained items reflected the same [10]. The treatment signified the role of top-down processing in removing the block on lexical semantic breakdown and this technique would have allowed the participants to self-cue themselves and also strengthen the semantic network, which further would have facilitated the retrieval of untrained items, however the limitation was only 10 participants were considered and the study has to be extended on a larger number to enhance the generality of the findings. The study can also be extended by considering the item frequency and complexity into consideration and the study can also be extended across the grammatical class by considering verbs.

Conclusion

The study was carried with the aim of determining the untrained item generalisation in persons with anomic aphasia. 10 participants with the diagnosis of anomic aphasia were considered and these participants were divided into two groups of 5 participants each. One group was treated using SFA while the other group was treated using PCA. The results showed that the individuals exposed to SFA were able to exercise associations better and score better on untrained item generalization. Previous studies in this direction used only trained items.

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