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Research Article

Sequence of Picture Presentation in Blocked Naming and its Relevance to Naming Abilities in Persons with Aphasia

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Abstract

Background: The study tests the two mechanisms of lexical semantic activation (facilitation versus inhibition) using blocked naming task.
Objective: To compare the naming accuracy scores on semantically related, unrelated and thematically related blocks: 9 participants with Aphasia (5 persons with anomic aphasia 4 persons with Broca's aphasia were considered) for the study. Blocked naming task was administered on the participants
Results: The mean scores were more for unrelated block compared to thematically related and semantically related blocks. The results on Friedman's test showed significant difference between the blocks. The descriptive scores in adjunct to the statistic favoured inhibition
Conclusion: The underlying competition among the related items in the semantically related blocks would have impeded the lexical activation in persons with aphasia.

Key words: facilitation; inhibition; paraphasia; competition; aphasia

Introduction

Lexical access refers to the phenomenon of "linking the lexical-semantic representation" with its phonological or orthographic representation [1]. The production of speech requires the intended meaning to provide access to the phonological form of the word that underlies its articulatory output. The activation and retrieval of this information, as sound meaning relationships of the lexical entries in the mental lexicon, is termed as lexical access. The three main cognitive processes involved in lexical access are lexical semantic activation, competition and selection. The serial search models postulate that a lexical item could only be in one location in the mental lexicon and retrieval is a step by step process. However, several categories could be used to determine its location. The autonomous search model is one such serial search model that views word recognition process as having three separate parts: orthographic (visual), phonological (sound) and semantic/syntactic (meaning). Input from any modality can be accessed one at a time and all the information is stored in the lexicon and not in the individual 'files'. The master lexicon is organized into three bins, with the frequent entries being stored on top. Entries are hypothesized to be searched in these bins, in a serial manner, until a relevant lexical entry is found. This is then cross referenced against the input to ensure accuracy for an exact perceptual match. Search is terminated once the correct lexical entry has been located. In activation, the individual searches their semantic memory for lexical entries that have semantic features related to the target item. Such lexical entries are excited and compete to be chosen. The lexical entry is chosen at a uniqueness point, where that lexical entry with the highest level of activation is finally selected as the most appropriate target.

During the lemma node activation stage, words related to the target will be activated and these 'related words' may either facilitate the activation of target word or may impede the activation of a given word. The former is called facilitation and the latter is called inhibition. The empirical evidence for facilitation and inhibition is derived from priming and word picture-interference paradigm respectively. The blocked naming task provides neutral evidence investigating facilitation versus inhibition.

When a target item is preceded by another item semantically related or unrelated to that target item, a facilitatory or inhibitory effect can occur. Various methods based on different underlying theoretical principles have been proposed to tap the patterns of lexical semantic activation. Studies based on the priming principle are used frequently, owing to the procedural simplicity. Priming refers to an implicit memory effect in which exposure to one stimulus influences the response to a subsequent stimulus. The first item presented is called the prime and the item to which a response has to be made is called the target. Semantic priming refers to the observation that there is an increase in the speed and/or accuracy of a participant's response to a target when exposed to a related as compared to an unrelated prime. In a blocked or cyclic naming on the other hand the pictures are presented in the form of cycles or blocks. For instance semantically related pictures would be presented in succession and would

impose constraints on activation, in contrast an unrelated block will have pictures from assorted categories. based on dependent variables like naming latency and accuracy for related versus unrelated blocks the mechanism of lexical semantic activation would be deduced (if naming latency and accuracy for related is better than unrelated, facilitation is assumed to be operational and visa-versa.

These two mechanisms of lexical -semantic activation have been investigated in persons with aphasia. The seminal study in this direction was done by Costa, Alario & Carmazza, 2005 [2]. This study used word picture interference paradigm. In this paradigm, the precursor is presented before the target. The pre-cursor was either related to the target semantically or was unrelated. Distractor-precursor words from the same category as the target produced interference while the distractor-precursor words from different category as the target produced facilitation. This study is important as it abolished the conventional view regarding facilitation and inhibition (the conventional view postulates the belief that the precursor or prime semantically related to the target can facilitate the target)

Schnur, et al, 2006 [3] used blocked naming task to study lexical access in individuals with non-aphasia and aphasia. The non-aphasia individuals comprised of controls to persons with aphasia. It was observed that the individuals in control group exhibited longer naming latencies when the pictures were 'blocked' by the lexical category and had increased repetition rate, Similarly the blocking effects were evident in persons in Broca's aphasia considered in this study. Further the error analysis revealed the errors increased as a consequence of competition in the related block. Thus, the proponents in the study clearly highlight the presence of inhibition' in lexical semantic activation.

A similar study was carried out by Creet, Howard and Nickels (2006) [4]. 23 participants with aphasia were considered for the study. The participants were asked to name 50 pictures on seven different occasions. Hence the paradigm was called as repeated naming tasks. It was found that 7 participants were able to name the pictures on a consistent basis and the authors highlighted the facilitation evoked by the pictures. In some participants considered for the study, there was inhibition also hence no conclusive evidence was derived pertaining to lexical semantic activation from the current study.

Another study carried out by Janssen, Schirm, Mahon & Caramazza (2008) [5]. The proponents in the current study called their naming paradigm as delayed naming task. The distractor words were super-imposed with the target and the task of the participants was to name the target word. In the first experimental condition, the target picture was preceded by the word by 1000 milliseconds, in the contrasting condition, the target picture superimposed the word and it was observed that semantic interference was observed even for words preceding the target, thus the inference observed not only the words interfered with the semantic activation but also when it preceded it. Thus, the different studies in this direction have evoked different findings and there is no uniform pattern pertaining to lexical semantic activation especially in persons with aphasia,

Need for the study: The salient feature of the current study is that, it used a thematic block, in addition to the conventional related and unrelated blocks as it can have differential effect (Pino etal, 2022) [6].

Aim:

In the current study, these two mechanisms of lexical semantic activation were investigated in individuals with aphasia.

Objectives:

To compare the naming accuracy scores for related, unrelated and thematic blocks.

Methods

Participants: Convenient sampling was used for the recruitment of participants and 9 participants were subsequently enrolled. As the task required the participants to have considerably good naming skills, persons with mild-moderate variants of Aphasia were considered. WAB-R (Ravikumar, Vijayashree & Shyamala, 2001) [7] revealed that 5 participants had Anomic Aphasia and 4 participants had Broca's Aphasia. The mean age range of the participants was 53.4 years and all the participants considered for the study were males. The average post stroke duration was 7.2 months. Some of the participants had received therapy in their past while few other participants were receiving therapy even at the time of conduct of the current study, however goals on naming were not considered for participants under-going therapy.

Stimulus and Procedure: Blocked naming task was administered on the participants. 36 pictures were presented in three blocks. (12 pictures in related category: Animals, 12 in unrelated and 12 in thematic category with round objects as the theme). The pictures were taken from copy-right free internet sources, the naming agreement was checked in between the three investigators of the current study, those items with 100 % agreement were considered for consolidating the final stimulus for the study.

Each picture within a block was displayed for 6000 milliseconds using Microsoft PowerPoint presentation. The slides were timed for this stipulated duration. The participants were asked to name the pictures as they were presented. Measures like vocal reaction time was not considered Responses were noted and were categorized as correct response, no response, semantic paraphasia, phonemic paraphasia, perseverations and time lapse response. Each correct response was given a score of 1, while the other categories of responses listed above were given a score of 0. The maximum score for each block was 12.

Results and Discussion

The participants with aphasia were further not sub grouped based on the type of aphasia as the sample size was limited. The median scores for the three blocks (related, unrelated vs thematic) were 5.8, 8.3 and 7.2 respectively (the maximum score is 12). The median scores were more for unrelated blocks, thematically related blocks and semantically related blocks. Informally it was noted that participants with Broca's aphasia had more of phonemic paraphasic responses while persons with anomic aphasia had more of 'no responses' followed by semantic paraphasia. The data was subjected to test of normality using Shapiro-Wilk's test of normality. The Z score obtained was 0.034 indicating that the data was non-normally distributed.

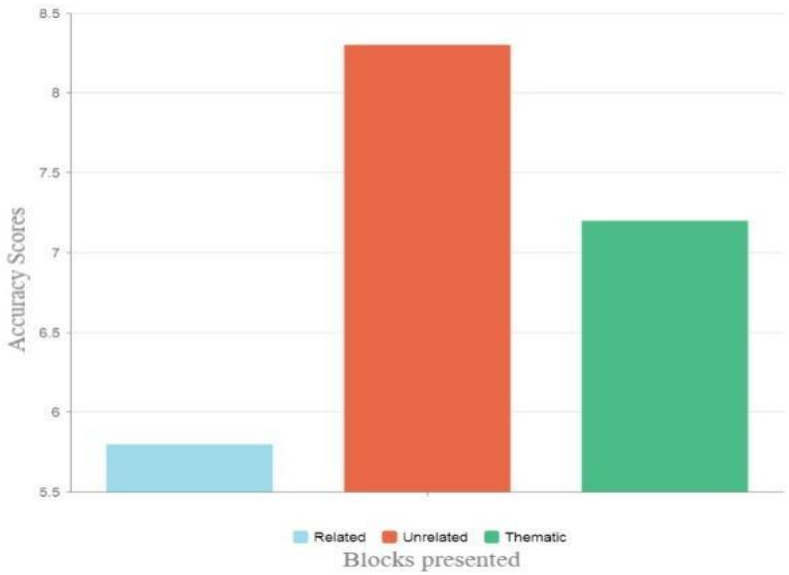

Figure 1: Median scores for the three blocks (related, unrelated and thematic)

Further Friedman's test was used to verify if there was any significant difference across the blocks and the X2 value was 2.33 ($p<0.05$) suggesting a significant difference across the three blocks. The descriptive values (median scores) were higher for unrelated blocks followed by thematic and related blocks. Low scores on related blocks compared to the unrelated blocks suggested inhibition. Each item in the related block would have impeded the activation of the successive item affecting the performance. Items in a semantically related block are presented in succession, when the items are presented in succession, it is assumed to impose constraints on lexical access as one lexical item would offer competition to the other item or in other words, the participant has to overcome the competition offered by the competitor lexical item to activate the target.

This was in consonance with the findings of Schnur, et al, 2006. However, this study used a comparative group design unlike the current study which involved only participants with Aphasia. It found that persons with aphasia were 'blocked' in other words, persons with aphasia performed poorly on semantically related block due to the impedance offered by the lexical items in the related block. The findings of the current study cannot be compared with the other studies as the 'phenomenon' under consideration facilitation versus inhibition is sensitive to the task undertaken. The other interesting finding was that scores on thematic block was better compared to related block showing that the categorically related and thematically related words had differential effect (Pino et al, 2022). The findings of the study can be considered as preliminary as it was done on fewer participants and the participants were further not grouped based on the type of aphasia.

Conclusion

The study was undertaken to investigate the mechanism of lexical semantic activation in persons with aphasia. Persons with milder variants of aphasia secured less scores for related compared to unrelated blocks suggesting inhibition.

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