

Is Lexical Semantic Impairment Persistent in Mild Cognitive impairment:? An Investigation Through Competence and Performance Based tasks

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Received Date: 23 October 2023 | Accepted Date: 11 November 2023 | Published Date: 30 December 2023

Citation: Abhishek B. Panchakshari, (2023), Is Lexical Semantic Impairment Persistent in Mild Cognitive impairment:? An Investigation Through Competence and Performance Based tasks. *J. Brain and Neurological Disorders*. 6(6): DOI: [10.31579/2642-973X/086](https://doi.org/10.31579/2642-973X/086)

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Abstract

Mild Cognitive Impairment is assumed to precursor to dementia. Even persons mild cognitive impairment would exhibit subtle impairments on lexical semantic domain. However the choice of linguistic tests would unveil this subtle linguistic impairment hence the choice of selection of linguistic tests becomes vital. The tests can be classified as competence and performance based tests. The current study investigates the presence of lexical semantic impairments in MCI. Semantic organisation task tapped the competence part while the conditioned naming task tapped the performance based task. The tasks were administered on 22 participants (neuro-typical and MCI). It was noted that the performance based task was more effective in identifying the lexical semantic impairment as there was a significant difference between the two groups on the conditioned naming task.

Keywords: cognitive linguistic deficit; lexical access; task complexity; organisation

Introduction

Lexical access refers to the process of retrieving information from the lexicon. It involves three stages namely conceptual activation, lemma node activation and phoneme retrieval. The conceptual semantic activation would be activated through the inherent characteristics of the stimulus. This would be directly responsible for lemma node activation where multiple lemma nodes matching with concept would get activated. One lemma node with the greater threshold would get activated following this phoneme retrieval takes place. Various methods ranging from naming tasks to electro-physiological tasks have been used to assess lexical access. Tasks like naming assesses the performance component of lexical access while tasks like semantic categorisation, semantic judgment assesses for competence aspects. The lexical semantic impairments is often assessed in acquired disorders like Aphasia and Mild Cognitive Impairment.

Mild Cognitive Impairment is a cognitive linguistic impairment [1]. It is a condition where there is a evident cognitive deficit in both the subjective and cognitive functions and the quantum of deficits is more than normal aging and less than frank dementia. Some proponents in this direction term mild cognitive impairment as a precursor to dementia [2] Persons with MCI exhibit mild/subtle deficits on the semantic domain.

Decline in the ability to access information related to lexical access is commonly reported in MCI [3,4,5]. The problems on semantic domain

may manifest as word finding difficulty, degraded semantic information on discourse, category specific semantic impairment. The extent of difficulty gradually increases and hence it becomes important to identify the subtle lexical semantic impairment. The current study deals with the comparison of abilities pertaining to lexical semantic abilities in individuals diagnosed with MCI and age matched cognitively normal healthy adults.

Need of the study: Lexical semantic impairment is vulnerable to go unidentified in individuals with Mild cognitive impairment. As the condition shows the inception of such conditions in this population. Some of the tasks used are either competence based or performance based tasks, as the condition is mild as specified above. Hence the choice of the tests also becomes important for identification of such conditions

Objectives

To compare the performance of individuals diagnosed with Mild Cognitive Impairment and neuro- typical adults on semantic categorisation task

To compare the performance of individuals diagnosed with Mild Cognitive Impairment and neuro- typical adults on conditioned naming task

Methods

A total of 22 individuals were recruited for the study. Out of these 22 participants, 10 participants were clinically diagnosed to have MCI (based on the scores of Montreal Cognitive assessment as a screening tool and Battery of Cognitive Communication Disorders in Kannada for cross-confirming the diagnosis). All these participants were males and native speakers of Kannada and the mean age of the participants was 55.1 years. The group comprising these participants was designated as group 1 and the second group comprised of 10 neuro-typical participants with no history of cognitive or communication disorders. MOCA was administered on these participants and the scores were greater than 26 for this group.

Two tasks as aforementioned in the objectives were designed to assess the lexical semantic abilities in the participants of the two groups. Semantic categorisation task assessed the competence part while the conditioned naming task assessed for the performance part. 30 random pictures were used in the semantic categorisation task and the task of the participant was to designate the lexical item to the prescribed lexical category. To evoke complexity, lexical items belonging to proximal lexical categories (like birds v/s animals; vegetables versus fruits were used) and each correct response was given a score of 1 while an incorrect response is given a score of 0. The maximum score was 30 for this task.

The conditioned naming task was administered on the participants. Colour pictures were used for the task. The pictures were associated with blue, red and green dots. The participant was asked to name the picture when associated with blue dot, name the superordinate category when associated with green dot and the participant was supposed to name another picture belonging to the same category as the target when the picture was associated with red dot. A trial block was given to acclimatise the participants. 30 pictures were used for this task, each correct response yielded a score of 1 while an incorrect response was given a score of 0 and the maximum score was 30.

Results and Discussion

The mean/median scores for group 1 and group 2 participants was computed and analysed for task 1 (semantic categorisation) and task 2 (conditioned naming task) for group 1 (MCI) and group 2 (neuro-typical participants). For task 1, group 1 secured a median score of 18 while group 2 secured a score of 27. For task 2, group 1 secured a median score of 14 and group 2 participants secured a score of 26. In order to verify if there was any significant difference between the two groups, Mann Whitney U test was used and the Z scores for two groups on task 1 and task 2 was 2.12 and 2.67 and the corresponding p values showed significant difference for both the tasks. In addition to the pre-set objectives, Wilcoxon's signed rank test was used to compare within group performance for determining task complexity. The Z score for group 1 was 0.08 while the Z score for group 2 was 1.12 and the corresponding p value showed no significant difference indicating that there was no overt difference between the two tasks for the two groups providing impression

task the competence and performance based task were of equal complexity against the traditional claim that the competence task is relatively simpler. Overall, the results signify that the individuals with Mild Cognitive Impairment performed poorly compared to age matched neuro typical adults on the two domains of lexical semantic processing. The lexical semantic domain in MCI has evoked mixed findings as some proponents in this direction [4,5] believe that the loss of semantic knowledge may not be essential in MCI and may not be expressed overtly. However the findings of the current study shows that though the quantum of deficits is mild in this population, they definitely experience subtle difficulties which must be addressed in the therapeutic intervention for preventing the semantic knowledge from depleting. Loss of semantic knowledge is an essential trait in most types of dementia hence it is essential for identifying the lexical semantic impairment at the initial stage itself and prevent the domain from further deterioration. The study has to be extended on more participants with MCI to warrant the generalisation of the findings.

Conclusions

The current study aimed to assess the lexical semantic processing in individuals with MCI and healthy neuro typical participants. Semantic categorisation and conditioned naming task was administered on all the participants. It was observed that the participants with MCI performed poorly compared to neuro typical participants on both these tasks indicating that the lexical semantic processing is subtly compromised in this population and addressing the need of intervention.

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DOI:10.31579/2692-9422/086

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