



Appraising the Conceptual and Lexical Retrieval in Persons with Fluent and Nonfluent Aphasia

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Abstract

Objective Conceptual knowledge refers to understanding and interpreting concepts and their relationships. Lexical knowledge is the knowledge that can be expressed through words. It entails meaning of words and their relationships. Word retrieval impairments are the most radical deficits that restrict communicative functions for individuals with aphasia. The current study aimed to compare the conceptual and linguistic impairments associated with fluent and nonfluent persons with aphasia (PWAs).

Materials and Methods A total of 15 PWAs were recruited for the study, out of which, 8 were fluent aphasia and 7 were nonfluent aphasia. One picture-based conceptual task (picture comparison judgments) and one verb-based linguistic task (word comparison judgments) were used as the experimental paradigm.

Results and Conclusion The findings of the study showed no significant difference in the performance of conceptual and lexical retrieval abilities in both fluent and nonfluent aphasia. The current study highlights the fact that both conceptual and lexical retrieval impairments prevail in both fluent and nonfluent aphasia.

Keywords

- ▶ anomic
- ▶ stroke survivors
- ▶ aphasia
- ▶ conceptual task

Introduction

Aphasia is defined as the loss or deficiency in expressive and/or receptive language, and is generally caused by a left hemisphere lesion, such as a stroke.¹ Aphasia is a common cause of neuropsycholinguistic (or cognitive-linguistic) impairment, and is the most disabling conditions, affecting communication and social skills in general. Generally, persons with aphasia (PWAs) have deficits in combining words together, framing meaningful sentences, having trouble reading, or having a hard time in understanding the spoken language. These deficits can be caused due to impairment at the conceptual level or at the lexical level.

A concept may be considered as a basic unit of thought. Conceptual knowledge can be described as ideas, relationships, connections, or having an understanding of something.² Conceptual knowledge refers to understanding and

interpreting concepts and concepts' relationships.³ Conceptual knowledge is needed as a guide for our actions. Our knowledge of how to use concrete objects as a guide for our actions is our conceptual knowledge.⁴ Lexical knowledge is knowledge that can be expressed through words.⁵ The lexical knowledge consists of all the information that we know about words and their relationships.

The term conceptual impairment refers to a disturbance in the thinking process or in the ability to formulate abstract ideas from generalized concepts.⁶ Deficit in lexical processing refers to any difficulty producing a single word, or difficulty in reading a word and comprehending a single word, phrase, and sentence level. Lexical errors (e.g., reading table for chair, chain for chair, etc.) can also be considered as lexical deficits.⁵

Lexical deficits are predominantly occurred for verbs, verb retrieval deficits are pervasive that can have profound impact

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on communication of PWAs.⁷ In general, impairment in verb retrieval might occur owing to lexical or conceptual-processing deficits. The verb retrieval process, therefore, plays an important role in sentence formulation.

The retrieval of verbal information in healthy adults and in PWAs depends on both linguistic and conceptual processing. In PWAs, these deficits can co-occur and be correlated, but for patients with various acquired brain injuries, these deficits can be dissociated. Verb retrieval impairments can be caused by impaired conceptual action processing than lexical retrieval impairments in aphasia.⁷ Despite the positive findings, the study findings seem to be in preliminary, owing to heterogeneous population and small sample size. Also, the positive findings are evinced merely in English language, and this necessitates the researchers to explore the paradigm in other languages, owing to the difference in the sentence structures of the languages. So thereby to bridge this gap, the current study focuses on understanding how PWAs word retrieval impairment occurs in conceptual and linguistic processes in Kannada language (a regional language spoken in the state of Karnataka, India).

Understanding the dissociations between verb and lexical impairments is crucial, owing to understanding what kind of cues facilitate better retrieval or what kind of strategies can be ideal during assessment of conceptual or lexical level impairment in PWAs. Thus, the study aimed to compare the conceptual and linguistic impairments associated with fluent and nonfluent PWAs. To accomplish the aforementioned aim, following objectives were assessed. The performance of conceptual and lexical retrieval abilities in fluent and nonfluent aphasic in isolation was compared. Further, the performance of conceptual retrieval abilities in fluent versus nonfluent aphasia was compared. The performance of lexical retrieval abilities in fluent versus nonfluent aphasia was compared.

Materials and Methods

A total of 15 PWAs aged between 30 and 80 years were recruited, out of these participants “8” PWAs were fluent and “7” were nonfluent aphasia (see ►Table 1). These participants were selected based on convenient sampling method,

Table 1 Demographic characteristics of participants

Sl. no.	Age/sex	Education	Occupation	TPO	Etiology	Diagnosis
1	66 y/M	10th grade	Driver	6 mo	L-MCA CVA	Anomic aphasia
2	59 y/M	12th grade	Business	7 mo	L-MCA CVA	Broca's aphasia
3	68 y/M	10th grade	Business	8 mo	L-MCA CVA	Broca's aphasia
4	79 y/M	10th grade	Farmer	3 mo	L-MCA CVA	Anomic aphasia
5	57 y/M	Graduate	Business	11 mo	L-MCA CVA	Anomic aphasia
6	38 y/M	Graduate	Accountant	3 mo	L-Frontoparietal CVA	Wernicke's aphasia
7	52 y/F	10th grade	Housewife	2 mo	L-MCA CVA	Broca's aphasia
8	72 y/M	Graduate	Ex-military	6 mo	L-MCA CVA	Broca's aphasia
9	48 y/M	Graduate	Priest	6 mo	L-MCA CVA	Anomic aphasia
10	69 y/M	Graduate	Military	2 mo	L-MCA CVA	Broca's aphasia
11	47 y/M	Graduate	Salesman	9 mo	L-MCA CVA	Broca's aphasia
12	50 y/M	10th grade	Farmer	6 mo	L-Fronto parietal CVA	Wernicke aphasia
13	60 y/M	10th grade	Waiter	8 mo	L-Fronto parietal CVA	Wernicke aphasia
14	56 y/M	12th grade	Salesman	5 mo	L-MCA CVA	Anomic aphasia
15	50 y/M	10th grade	Farmer	9 mo	L-MCA CVA	Broca's aphasia

Abbreviations: CVA, cerebrovascular accident; L-MCA, left middle cerebral artery; TPO, time postonset.

and cross-sectional research design was used to carry out the experimental paradigm of the study. Participants selected for the study given their consent to be the part of the study, and the study was approved by the Father Muller Institutional Ethics Committee (FMIEC/CCM/268/2022).

The inclusion criteria followed in the study were the participant should be right-handed prior to stroke, should be native Kannada speakers (fair to good proficiency in reading and writing), and should be free from vision impairment and hearing loss. Similarly, the current study inculcated following exclusion criteria such as aphasia with concomitant disorder, PWAs who had <5 score in auditory verbal comprehension, education levels below the 10th grade, aphasia due to head injury, history of behavioral issues, drug or alcohol abuse, and PWAs scoring >100 on action naming test (ANT), if PWAs are showing any of the aforementioned conditions, then those participants were excluded from the study.

Shyamala et al⁸ used the Kannada version of Western Aphasia Battery to determine the presence and type of aphasia. Girish⁹ used ANT to assess the verb retrieval abilities. To assess verb and action processing, all PWAs underwent a series of behavioral language and conceptual knowledge tests. The stimulus was prepared using a standardized action knowledge battery.⁷ The battery intended to assess lexical and conceptual abilities of verbs in PWAs. The action knowledge battery comprised (1) two picture-based conceptual tasks (picture attribute and picture comparison judgments) and (2) two verb-based language tasks (word attribute and word comparison judgments).

The study utilized task such as naming, picture comparison, picture attribute, word comparison, and word attribute. All these tasks were presented via laptop. Participants were given specific instructions for each task with the practice trials. In addition to an action naming task, participants also performed two conceptual, picture-based tasks, that is, picture characteristics and picture comparison judgment task and two linguistic, verb-based tasks such as word attributes and word comparison judgment task, and one verb retrieval task. Time given to respond to the stimulus was 60 to 80 seconds and interstimulus interval of 30 seconds was fixed.

To delineate the naming task ($N=20$ items), the PWAs enrolled in the study was shown an action and solicited for the response pertaining to the item presented. If the response was evinced in the absence of cues, a score of "two" was awarded. If the participants were unable to respond, they were provided with semantic cues initially, followed by contextual and phonemic cues. The score of "one" was provided in case of semantic cues, phonemic cues, or contextual cue. Score of "zero" was given for incorrect or incomplete response (see the presence of noun or verb).

In picture comparison task ($N=20$ items), the PWAs were provided with three choices here PWAs were instructed to select to the image which has different meaning among them. In picture attribute task ($N=20$ items), the PWAs were provided with two colored images of actions for each item, along with an attribute judgment. In word comparison

task ($N=20$ items), the PWAs were presented with three printed verbs for each item. The verbs were read aloud by the experimenter, here PWAs were instructed to choose the verb that differed from the array of choices. In word attribute task ($N=20$ items), the PWAs were presented with two printed verbs and an attribute judgment question. The researcher read the verbs and the question out loud. The participant was asked to choose the verb that best addressed the given question (e.g., "Which action would make to go urgently to a place?").

In all the aforementioned tasks, PWAs were score based on binary system, that is, score of "one" was awarded for the correct response, score of "zero" was provided in case of no response, incorrect, or incomplete response (see the presence of noun or verb).

Version 17.0 of the Statistical Package for Social Sciences (SPSS) was used to analyze the data. The Shapiro-Wilk's test was used to determine the normality for the computed data, and the results showed data were normally distributed ($p>0.05$). Owing to which parametric tests were used to analyze the data. Using the paired *t*-test within groups comparison was done. Using an independent *t*-test, groups were compared against one another.

Results

Descriptive analysis evinced no difference in the performance of fluent aphasia in both conceptual and lexical tasks. Further similar trend of results was noted even in nonfluent aphasia for both conceptual and lexical tasks (see ►Fig. 1).

Further paired *t*-test was used to see the statistical difference and the results evinced there is no statistically significant differences between the performance of conceptual and lexical retrieval skills in both fluent and nonfluent aphasia (fluent aphasia: $t(7)=0.29$, $p=0.77$; nonfluent aphasia: $t(6)=0.08$, $p=0.93$) (see ►Table 2).

The descriptive analysis revealed that the mean scores for nonfluent aphasia are slightly higher than for fluent aphasia (see ►Fig. 1). Further, independent *t*-test was used to see the statistically significant difference and results showed that there is no statistically significant differences between the performance of conceptual retrieval skills in fluent and nonfluent aphasic speakers (fluent aphasia: $t(7)=0.29$, $p=0.77$).

The descriptive analysis revealed nonfluent aphasia has marginal increased mean scores than for fluent aphasia. Further, independent *t*-test was used to see the statistically significant differences and the results discerned there were no significant differences between the lexical retrieval abilities of fluent and nonfluent aphasia ($t(6)=0.08$, $p=0.93$).

Discussion

The study focused on understanding how the verb retrieval affects, if there is specific impairment at conceptual or lexical level. The study emphasized the significance of lexical-conceptual system interactions in defining verb retrieval performance in PWAs. In stroke survivors, lexical and

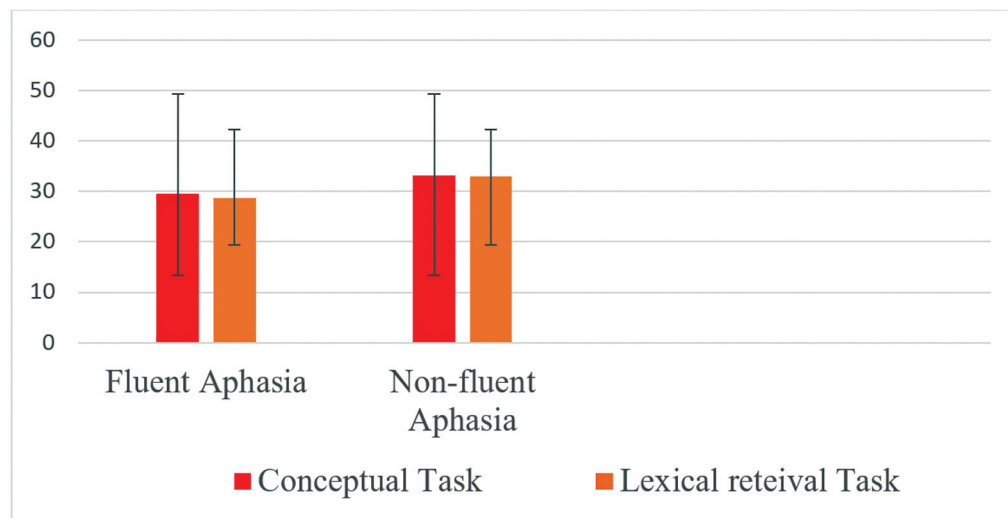


Fig. 1 Mean scores of fluent and nonfluent aphasia across conceptual and lexical tasks.

Table 2 Score of participants on conceptual and lexical tasks

Sl. no.	Type of aphasia	Action naming	Conceptual task		Lexical task	
			Picture comparison	Picture attribute	Word comparison	Word attribute
1	F	40	19	19	15	20
2	N	32	16	19	10	17
3	N	34	10	20	10	19
4	F	30	8	16	7	9
5	F	36	20	18	19	18
6	F	30	10	12	12	14
7	N	40	17	19	16	18
8	N	30	15	14	16	18
9	F	38	17	19	16	18
10	N	38	9	20	14	19
11	N	28	14	20	16	20
12	F	30	11	11	14	12
13	F	40	11	19	9	20
14	F	40	13	13	17	20
15	N	36	19	20	16	20

Abbreviations: F, fluent aphasia; N, nonfluent aphasia.

conceptual processing deficits are commonly noticed and there are evidence manifesting that lexical features and conceptual representations may aid to pinpoint verb retrieval deficits.^{10,11} The interactions or potential links between lexical and conceptual deficits and their interactions with language functions such as naming has not yet been demonstrated. Additionally, the evidence is inconclusive as to whether or when lexical and conceptual action-processing abnormalities may separate after a stroke.¹² Thus, it is unclear how verb retrieval issues in aphasia

are affected by abnormalities in lexical and conceptual action processing.

Processing of lexical items, conceptual knowledge, and action naming were all three sets of tasks that PWAs consistently underperformed. These results confirm earlier research showing that action naming (verb retrieval) is frequently reduced in aphasia, with verb retrieval deficiencies present in ~70% of aphasics.¹³ They are also in line with other research showing that aphasia in particular and stroke specifically may both affect processing at lexical and

conceptual action.^{12,14} It is noteworthy that conceptual and lexical abilities both predicted success in naming actions, and the presence of aphasia increased the influence of both traits on naming abilities.

The current study did not evince any statistically significant difference between the performance of conceptual and lexical retrieval skills in fluent and nonfluent aphasic speakers in isolation. The findings of the study posit that fluent and nonfluent aphasia groups retrieve verb both at lexeme and lemma levels.^{12,14} These results of the study could also be attributed to the complexity of the tasks, in which in both the conditions investigator employed merely verification task. Hence, the response would be better performed.

Additionally, the current study also showed no changes in fluent and nonfluent aphasia in conceptual retrieval tasks. Furthermore, there were no observable differences in lexical retrieval abilities between fluent and nonfluent aphasic speakers. Words were utilized in lexical, and pictures were utilized in conceptual tasks deemed to lack complexities. Thus, the PWAs responded with ease to the given stimulus.

Furthermore, the ANT test showed that persons with fluent aphasia manifest impairment at both conceptual and lexical abilities. These results are in consensus with Saygin et al¹⁴ who evinced that the participants with mild and fluent aphasia exhibited a correlation between conceptual and linguistic tasks. On the other hand, participants with severe and nonfluent aphasia showed profound effect at linguistic performance.

The current study findings show, regardless of conceptual-linguistic correlations, persons with nonfluent aphasia show profound impairment at both conceptual and lexical action processing. These findings are novel, and they show that verb retrieval problems in aphasia are caused by problems with both lexical and conceptual processing.

Limitations

The study exclusively employed ANT test to identify the retrieval impairment in PWAs. However, the ANT test only assesses performance concerning semantic and phonemic cues, as well as error responses. Along with ANT, the other level of assessment at sentence and conversation level is recommended for comprehensive evaluation. Employing the verification method captured responses for both conceptual and linguistic tasks, yet integrating verbal retrieval methods could offer deeper insights into a wider range of responses.

Conclusion

The current study findings shed a light on equally affected conceptual and lexical impairments in PWAs, irrespective of their types. The study results assist in documenting difficulties with retrieving information either at the conceptual or lexical level. This enables speech language pathologists to determine the most effective cues for therapy depending on the specific nature of the impairment. However, this result should be interpreted with caution owing to small sample size and lack of complexity associated with the experimental paradigm.

Authors' Contribution

D.P. contributed to conceptualization and methodology. D.P. and A.S. supervised the study. Investigation and writing—original draft were performed by L.L.T. and D.P. Writing—review and editing was performed by A.S.

Ethical Approval

The study is approved from the broad of Father Muller Medical College, Mangaluru, India (FMIEC/CCM/268/2022).

Conflict of Interest

None declared.

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