

# Verbal Fluency in Dementia: Changes over Time

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## Introduction

- Dementia is a progressive condition characterized by a loss of cognitive function (Alzheimer's Association, 2017).
- Word finding difficulties have been a well-documented language deficit that becomes present during the early stages of dementia (Braaten et al., 2006).
- The verbal fluency task is used by professionals to measure semantic and phonemic aspects of word finding.
- In the Semantic tasks, participants are given one minute to produce as many words as possible in a specific category (e.g., Food or Animals).
- In the Phonemic task, participants are given one minute to produce as many words as possible beginning with a specific letter (e.g., S or F).
- Individuals with dementia have changes in cognition over time; however, more research is needed on how these changes impact verbal fluency.

## Purpose

1. Investigate the changes in semantic and phonemic verbal fluency tasks over time in four participants with dementia.
2. Analyze differences in the semantic and phonemic verbal fluency tasks with four analyses.
3. Explore difference amongst individual performance .

## Stimuli

The researchers examined DementiaBank database files from a longitudinal study conducted at the University of Pittsburgh School of Medicine. The protocol administered to participants included the Cookie Theft picture description, fluency, story recall, and sentence construction tasks. A total of 725 individual files are stored in the DementiaBank database.

- Audio files used in the current study were excerpted from a longer assessment file, using sound editing software, to create segments representing only the verbal fluency task.
- These audio segments were approximately 1-2 minutes in length.

### Verbal Fluency Task

- Participants were asked to produce as many words as possible, in one minute, within a specific semantic and phonemic category.
  - Phonemic Task: "F" or "S"
  - Semantic Task: "Animals" or "Food"

## Participants

### Inclusion/Exclusion Criteria

- Native English Speaker
- Administered identical verbal fluency tasks during two independent testing periods
- Exclusive diagnosis of probable Alzheimer's type Dementia
- No History of other neurological conditions
- Report of Mini Mental State Examination (MMSE) score at each testing period (i.e., Time 1 and Time 2)

Four participants met the inclusion/exclusion criteria.

Pt.	Sex	Pt. Age (Time 1)	Pt. Age (Time 2)	Years between Visits	MMSE (Time 1)	MMSE (Time 2)	Semantic Task	Phonemic Task
1	Male	57	59	2	18	11	Animals	F
2	Female	56	59	3	19	7	Animals	F
3	Female	65	69	4	23	15	Food	S
4	Female	88	90	2	19	17	Animals	F
Mean		66.5	69.2	2.75	19.75	12.5		

## Procedures

- This is a retrospective, descriptive study of four participants' audio recordings of the semantic and phonemic verbal fluency tasks across two time periods.
- Each file was transcribed by a trained undergraduate speech language pathology student using Computer Language Analysis (CLAN) software and Codes For Human Analysis of Transcripts (CHAT) symbols.
- In addition to the CHAT symbols, specific analysis components were defined and examined for the purpose of the current study:

Unique Words: number of unique words produced

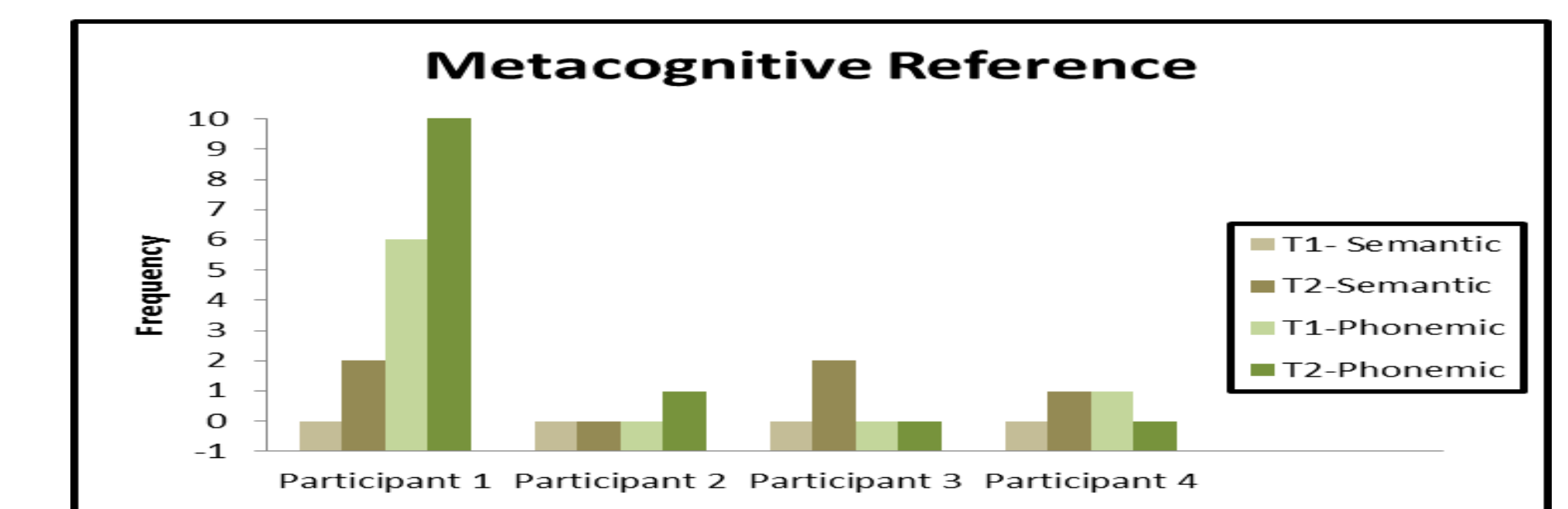
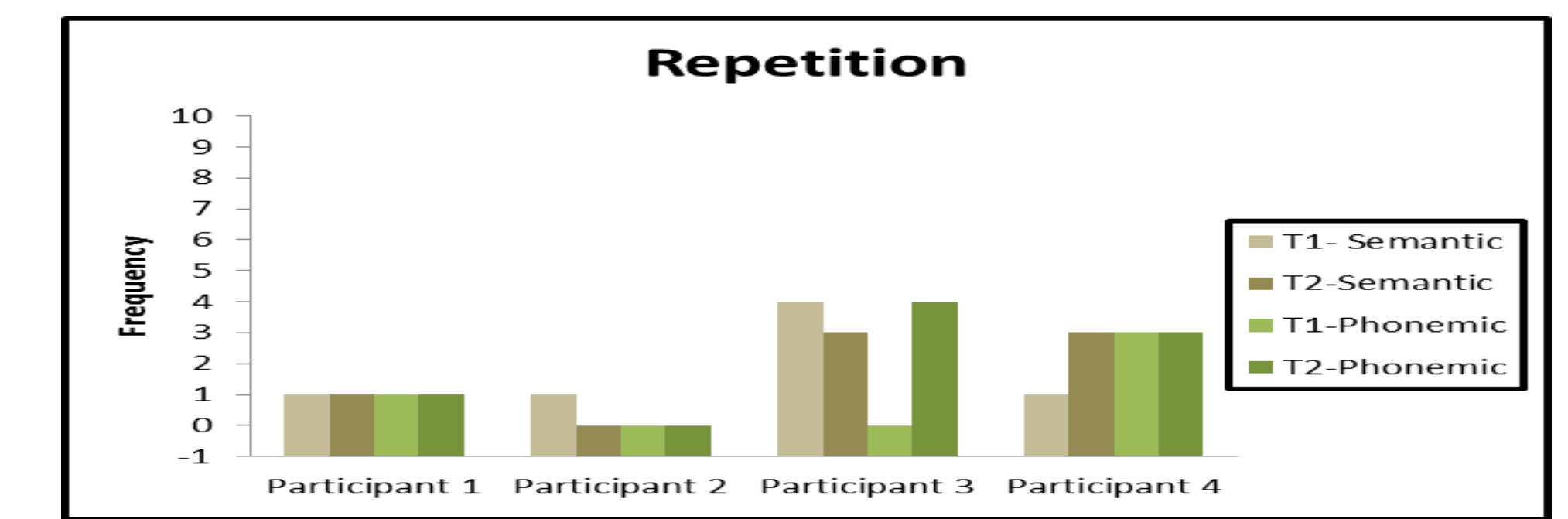
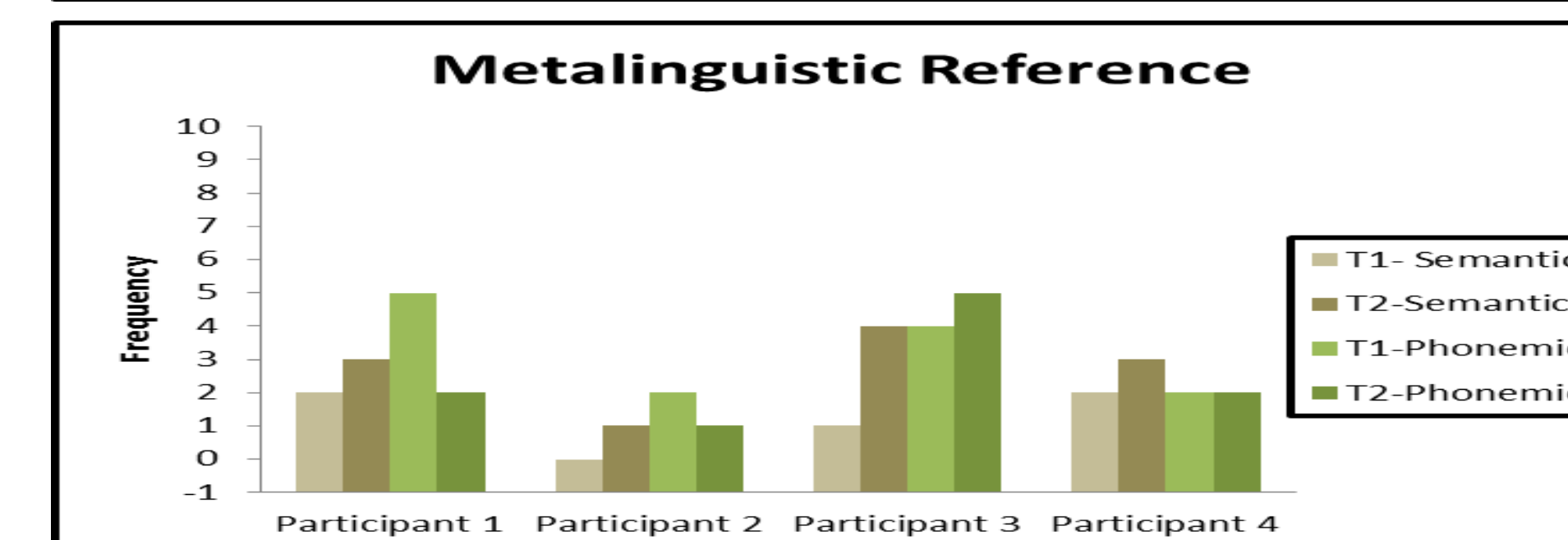
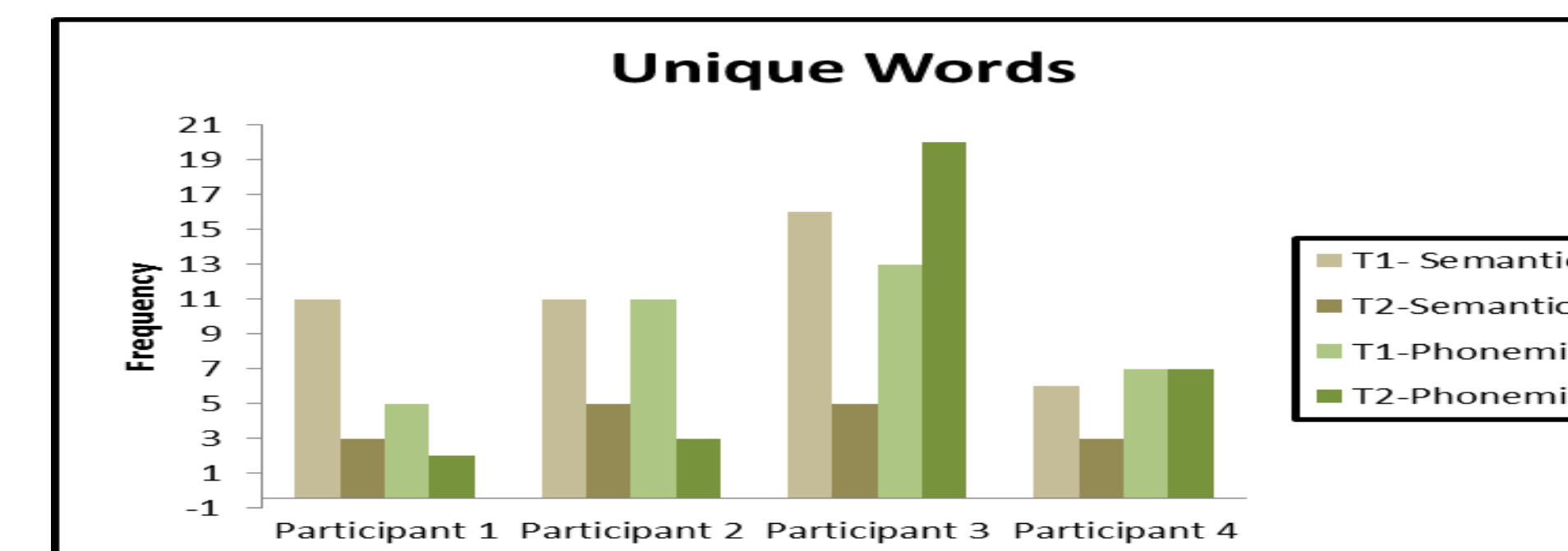
Repetition: number of times a word was repeated during one testing period

Metalinguistic reference: number of times the participant talked about the task (e.g., "did I say friend yet?")

Metacognition reference: number of times the participant talked about his or her memory (e.g., "I got a blockage or whatever it is.")

- Two researchers independently coded the transcripts (using an Excel spreadsheet with established component definitions). After independent coding, the raters compared results and further described the coding with examples.
- The raters used the new coding definitions and examples to re-code the transcripts. The researchers then compared results and calculated agreement reliability (mean=95% agreement; range=92-97%).

## Results



## Discussion

- The current study investigated individual performance on semantic and phonemic verbal fluency tasks across a minimum of a two-year time span. Participants produced a mean (range) of 11 (3-16) Unique Words on the Semantic task at Time 1 and 9 (3-20) words on the Phonemic tasks; this difference was not significantly different. There was a significant ( $p = .02$ ) mean decrease in words produced on the Semantic task at Time 2, but not on the Phonemic task. While all participants produced fewer words at Time 2 on the Semantic and Phonemic tasks, one participant increased the number of words on the Phonemic task at Time 2.
- Participants produced fewer overall repetitions of words on both tasks, ranging from 0-4. At Time 1 and 2 the mean number of repetitions on the Semantic task was 1.75; on the Phonemic task the mean numbers of repetitions was 1 and 2, respectively. These means were not significantly different. Participants 3 and 4 maintained or increased the number of unique words produced during the phonemic task at T2, and they produced the greatest frequency of repetitions. This may reflect the effort expended to retrieve words beginning with a specific letter; possibly a more difficult task than semantic category retrieval. Participant 3 was the only participant with the "Food" semantic prompt and "S" phonemic prompt and produced the largest frequency for both unique words and repetitions produced. It is possible that specific prompts may impact individual performance on the task.
- Every participant increased the number of metalinguistic references produced during the semantic verbal fluency task at Time 2, from a mean of 1.25 to 2.75, that was significantly different ( $p=.05$ ). This trend was not observed during the phonemic task (3.25 and 2.5, respectively). This finding was unexpected due to the nature of the phonemic task that required attention to a specific linguistic feature.
- Participants increased the overall number of metacognitive references produced during the semantic verbal fluency task at Time 2, from a mean of 0 to 1.25 and the phonemic verbal fluency task at Time 2, from a mean of 1.75 to 3.25. Although a larger increase was observed for the phonemic verbal fluency task, it was largely due to Participant's 1's frequency increase from 6-12 at Time 2. Participant 1 produced more metalinguistic and metacognitive references than the number of unique words produced during phonemic tasks. Due to the increased meta-references, changes in performance may be due to impairments in both executive control and lexical retrieval.

## Conclusion

- Overall, participants' frequency of the number of unique words significantly decreased over time during the semantic verbal fluency task. The decreased fluency highlights the progressive impairments in lexical retrieval for individuals with dementia.
- No differences were identified between semantic and phonemic tasks across all analyses. These findings are not consistent with previous research (Lin, Bourgeois, & Feth, 2013). The current study's small sample size limits interpretation of the data. Future research should continue to investigate longitudinal changes with a larger sample.
- Each participant performed uniquely in the current study. More research is needed to investigate individual changes over time on the verbal fluency task. Examining individual changes will help clinicians develop personalized interventions.