



Linguistic Cues to Dementia in Spontaneous Speech: A Dictionary-Based Analysis

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Introduction

- Alzheimer's is a neurodegenerative disorder characterized by cognitive impairment and the formation of amyloid- β plaques and neurofibrillary tangles (Crew, 2010).
- Natural language reflects individuals' mental states and traits (Tausczik & Pennebaker, 2010), and may offer a more complete picture of psychosocial processes related to cognitive decline than neuropsychological tests alone.
- Mild cognitive impairment can be identified in older adults with 84% accuracy in transcripts of spontaneous speech recordings (Asgari, 2017) using features from the Linguistic Inquiry and Word Count (LIWC 2015) program (Pennebaker, Boyd, Francis, & Booth, 2015).

Research Questions

- Will past results from case studies of written text samples replicate in spoken language? What other differences will emerge?

Method

- Recorded speech samples of the Cookie Theft picture description task, gathered by the Alzheimer and Related Dementias Study at the Pittsburgh School of Medicine (Becker, 1994).
- Samples included 104 neurotypical elderly adults for controls, 208 people probable or possible for Alzheimer's, and 85 patients with other dementia diagnosis (Becker, 1994).
- Dialogue was extracted from transcripts downloaded from www.dementia.talkbank.org.
- Transcripts were analyzed with LIWC 2015 (Pennebaker, Boyd, Francis, & Booth, 2015), a dictionary-based text analysis program that assesses use of over 90 linguistic, psychological, and topical categories.
- Best-fit logistic regression model predicts dementia vs. control classification with 78.8 % accuracy.



"Tell me everything you see going on in the picture."

Dementia

"**She's** uh running the water over. Can't see **anything** else. No. **Okay. She's she's** step in the water." (more **pronouns**, **informal**, **periods**)

Control

"**The** mother **is** washing dishes and she's obviously thinking of something else because **the** water's pouring out over **the** uh sink." (more **articles**, **big words**, **auxiliary verbs**)

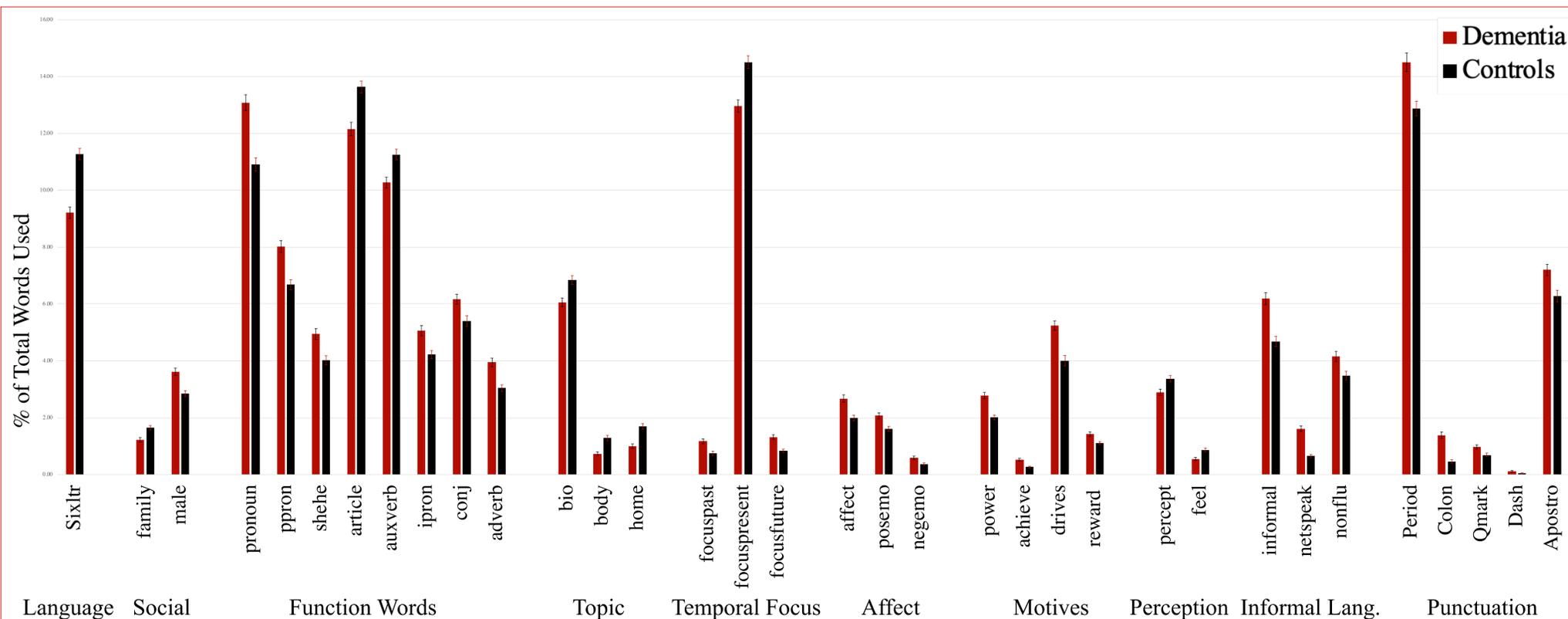
Edited for readability. Group-typical words are highlighted in red.

Results

- In independent samples t-tests, 37 of 91 LIWC categories differed significantly at the $p < .01$ level – far more than expected by chance.
- As predicted, dementia patients used significantly more nonfluencies (*er*, *hmm*, *umm*) when speaking than neurotypical controls in addition to more informal language (swearing and fillers), which may reflect inattention to social norms or word-finding difficulty.
- As originally predicted, dementia patients used fewer 6+-letter words, in contrast with results found in written texts (help forum messages); patients may attempt to retain vocabulary in writing but are unable to do so in speech with real-time processing constraints (Williams, 2018).
- Dementia dialogue included more pronouns and fewer articles, suggesting less concrete or less analytic language use.

Conclusions

- Results differ from analyses of help forums, supporting the hypothesis that dementia symptoms manifest differently in (asynchronous) writing and (synchronous) speech.



References

Asgari, Kaye, & Dodge. (2017). Predicting mild cognitive impairment from spontaneous spoken utterances. *Alzheimer's & Dementia: Translational Research & Clinical Interventions*, 3, 219-228.

Becker, J. T., Boller, F., Lopez, O. L., Saxton, J., & McGonigle, K. L. (1994). The natural history of Alzheimer's disease: description of study cohort and accuracy of diagnosis. *Archives of Neurology*, 51, 585-594.

Crews, L., & Masliah, E. (2010). Molecular mechanisms of neurodegeneration in Alzheimer's disease. *Human Molecular Genetics*, 19, R12-R20.

Pennebaker, J. W., Booth, R. J., Boyd, R. L., & Francis, M. E. (2015). Linguistic Inquiry and Word Count: LIWC 2015. Pennebaker Conglomerates.

Tausczik, Y. R., & Pennebaker, J. W. (2010). The psychological meaning of words: LIWC and computerized text analysis methods. *Journal of Language and Social Psychology*, 29, 24-54.

Williams, J. P. & Ireland, M. E. (2018, March) Linguistic Differences Between Alzheimer's Patients and Caregivers in Online Support Forums. Poster presented at Society for Personality and Social Psychology, Atlanta, GA.

Acknowledgments: I would like to thank the Honors College Undergraduate Research Scholars Program, supported by the CH and Helen Jones Foundations, and the TTU Center for Transformative Undergraduate Experiences for research funding.

I would also like to thank DementiaBank (www.dementia.talkbank.org) for access to their corpora.

