Why is speech rate slow in nonfluent/agrammatic primary progressive aphasia?

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Keywords: primary progressive aphasia, dementia, word duration, speech, language

Background: The diagnostic criteria for nonfluent/agrammatic primary progressive aphasia (naPPA) include "effortful, halting speech" but the features of such speech are not specified. Individuals with naPPA are known to pause more while speaking than healthy individuals do, but other durational characteristics of naPPA speech are not quantified. In this study, we examined durations of individual words and of pauses in connected speech to investigate the causes of slowed speech rate in naPPA.

Methods: We analyzed connected speech elicited by descriptions of the Cookie Theft scene in 30 individuals with naPPA, 22 with behavioral variant frontotemporal degeneration (bvFTD) as a brain-damaged control group, and 16 healthy controls (HC), matched for age, education, and sex. We automatically measured the durations of all words and pauses between words. We compared the durations of identical words spoken by the participants and the frequency and durations of pauses ≥ 150 msec occurring between words within clauses. We also investigated the effect of grammatical category and co-occurring apraxia of speech (AOS) on variation in word duration.

Results: The mean (±SD) speech rates in words per minute of individuals with naPPA, bvFTD, and HC were 61±27, 94±40, and 143±33, respectively. naPPA patients were significantly slower than both bvFTD and HC ($p<.01$), and bvFTD patients were slower than HC ($p<.01$). The durations of identical words in naPPA compared to both bvFTD and HC were significantly greater for all nouns, verbs, pronouns, determiners, and prepositions ($p<.01$). For adverbs, the duration for naPPA vs. bvFTD and HC was also significantly greater ($p<.05$). For the few comparable adjectives and conjunctions, naPPA had the longest durations, although the differences among groups were not significant. There were no significant differences in word duration between bvFTD and HC for any of the words common to both groups. The mean duration of pauses between words did not differ significantly among the three groups. In contrast, the mean frequency of pauses between words in naPPA was 36.3±17.8 per 100 words, compared to 12.6±6.3 per 100 words in bvFTD and 9.3±4.1 in HC ($p<.01$).

Conclusions: Speech rate in naPPA is slowed by lengthening of the durations of words, which occurs regardless of grammatical category or the presence of AOS. This lengthening is unique to naPPA, in contrast to bvFTD and HC. naPPA speech rate is also slowed by a higher frequency of pauses between words compared to other groups, but not by a greater duration of pauses.

Acknowledgments:
Research supported by NIH grants AG066597 and AG073510-01, Department of Defense W81XWH-20-1-0531, and the Samuel Newhouse Foundation.