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A syntax–lexicon trade-off in language production

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Spoken language production involves selecting and assembling words and syntactic structures to convey one’s...

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There are three types of primary progressive aphasia [PPA]: an “agrammatic” (or “non-fluent”) aphasia; and 2 lexicosemantic deficits which are subtly different: the “logopenic” variant, and the semantic variant. In both lexical deficits, patients have trouble in finding words.



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Neguine had a dataset from Brad Dickerson's lab, of 79 patients with different kinds of PPA performing a picture description task, of a picnic scene (used by clinicians to help diagnose patients).



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Neguine transcribed and automatically parsed the corpus using the Stanford parser, and compared it to the parsed Switchboard corpus.



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Although clinicians have long talked about there being syntax and lexical deficits in aphasia, there have not been limited quantitative ways to measure the syntax deficit in patients' productions.



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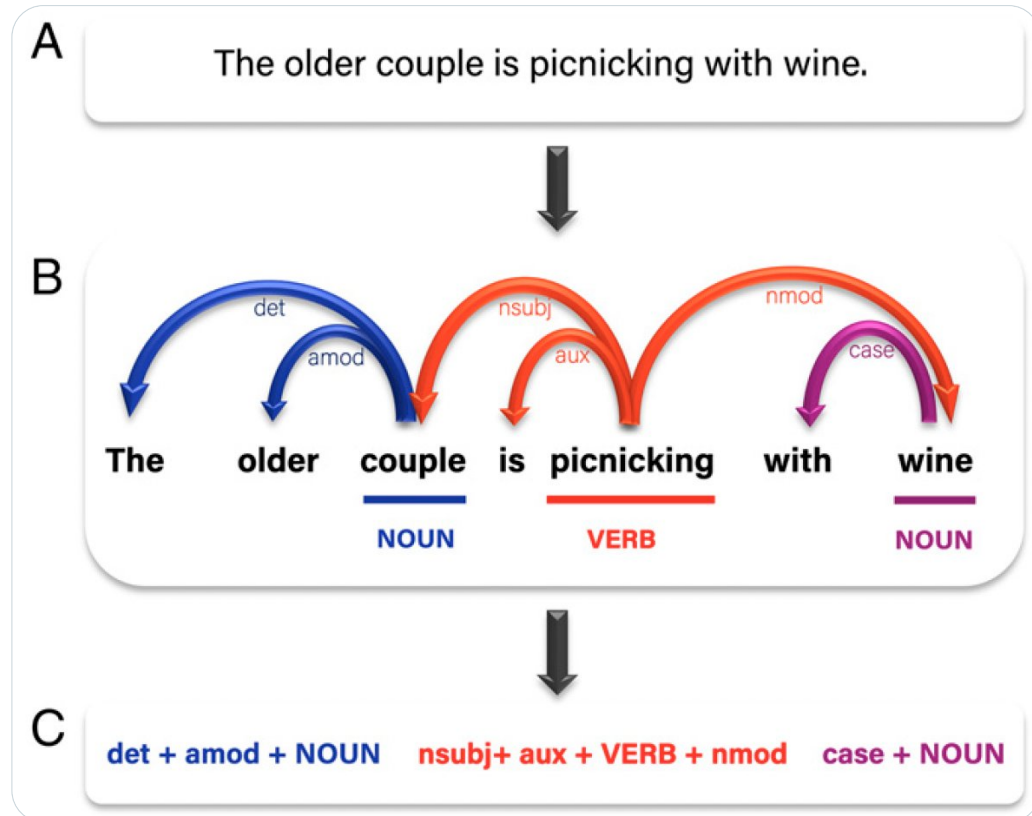




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We assumed that the lexical deficit could be measured by lexical frequency. We wanted a comparable syntactic measure: syntactic frequency, using dependency rules automatically extracted from the Stanford Parser's parses.



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A headed syntactic rule is determined by the head and all its dependents in a dependency parse, whether they occur on the left or right. Thus, the syntactic rules for the sentence “The older couple is picnicking with wine” are given in the figure.

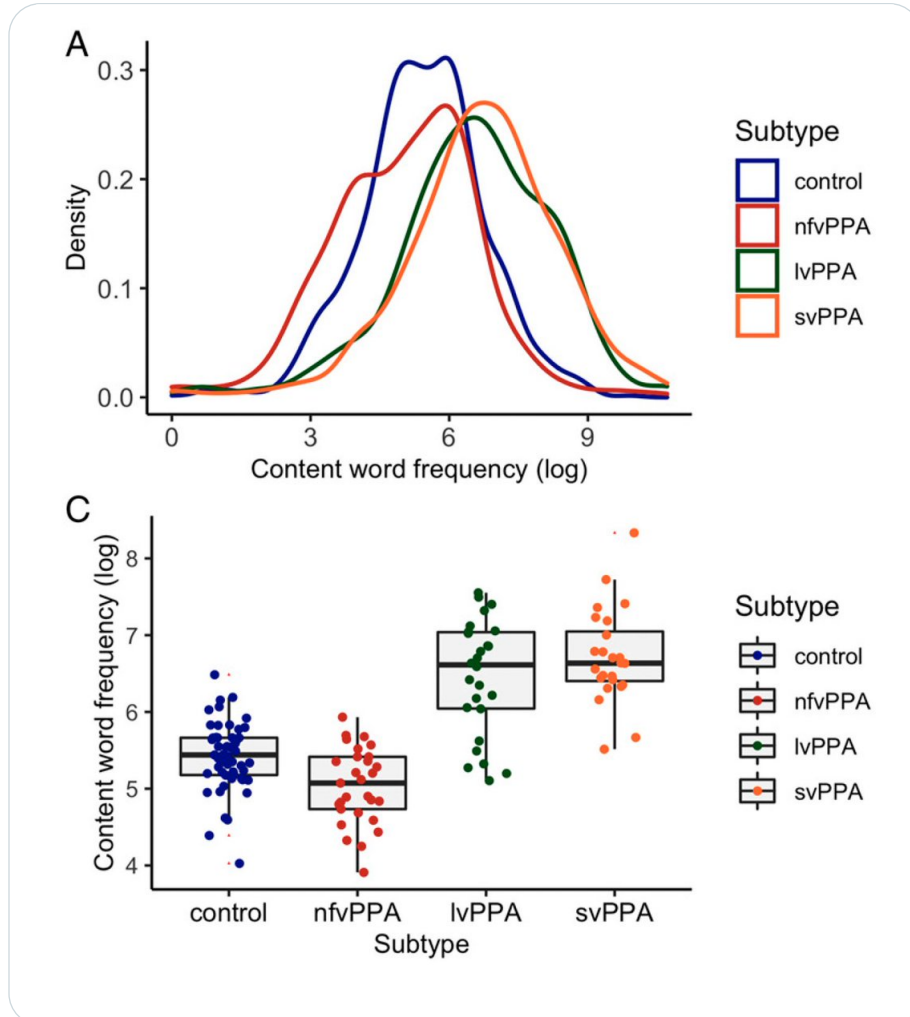




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Using these simple metrics, we discovered that patients with the lexical deficits (lvPPA and svPPA) produce words with higher frequency than either patients with the syntax deficit (nfvPPA) or controls. (figs 2A and 2C)



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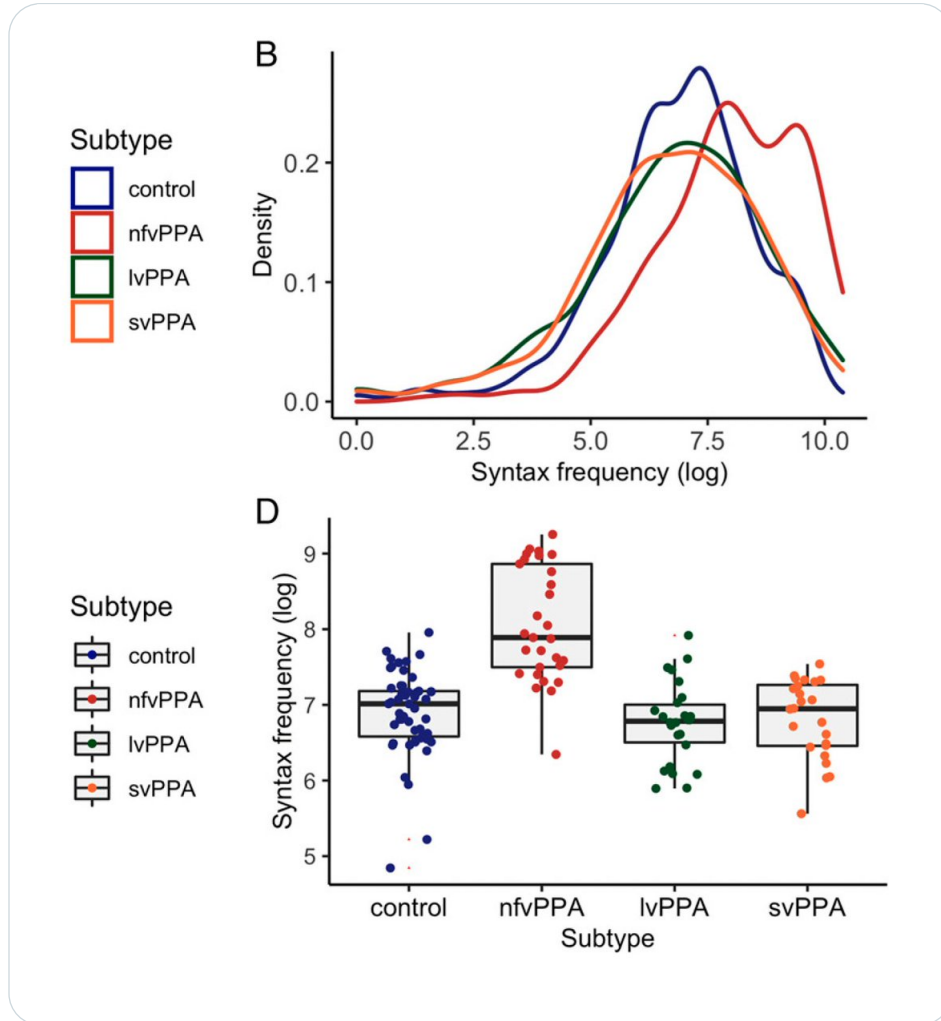
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And patients with the syntax deficit (nfvPPA) produce syntax rules with higher frequency than either patients with the lexical deficits (lvPPA and svPPA) or controls. (figs 2B and 2D)



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This shows that language is highly probabilistic. Patients (and people in general) seem to be sensitive to word frequency and syntax frequency. And we provide a simple metric of syntax frequency. In other experiments we show the metrics are at play in normal production too.



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