Core verb use in persons with aphasia during Cinderella retelling

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Intro:

- Verbs are crucial for the construction of well-formed sentences and ideas (Bird et al., 2003). They are considered more complex than nouns due to their greater syntactic weight (Druks, 2002).
- Persons with aphasia (PWAs) have more difficulty producing verbs than do individuals without aphasia (Bird et al., 2003; MacWhinney et al., 2010).
- PWAs with agrammatic speech have more impaired verb production than those with fluent aphasia (Breedin, 1996).
- Imageability and lemma frequency may play a role in determining which verbs are easier for PWAs to produce (Crepaldi et al., 2006).
- Most verb retrieval research involves assessment during confrontation naming tasks (Mayer & Murray, 2003); little is known about verb use in discourse.
- Structured story narration is an ideal task for assessment of functional language skills (Webster, et al., 2007). A large database of Cinderella Story transcripts, as told by control and clinical participants, is available for analysis via AphasiaBank.

Aims:

- MacWhinney et al. (2010) identified a list of core verbs thought to be relevant to retell of the Cinderella Story. We sought to investigate the differences in number of core verbs used by a large sample of PWAs to the number used by a matched sample of controls.
- Second, we examined differences in core verb usage between four subtypes of aphasia (Anomic, Conduction, Wernicke's, and Broca's).
- Lastly, we looked at the influence of imageability and lemma frequency on core verb production in PWAs.

Methods:

- Participants from AphasiaBank N=323 (168 PWAs, 155 controls):
  - Aim 1: Randomly selected pairs matched for gender and age. N=178 (89 controls, 89 PWAs [21 Broca's, 13 Wernicke's, 22 Conduction, 24 Anomic, 7 Global, 2 TCM]).
  - Aim 2: Restricted analysis to 4 subtypes due to limited number of participants in remaining subtypes. N=80 (21 Broca's, 13 Wernicke's, 22 Conduction, 24 Anomic)
  - Aim 3: Used the same randomly selected PWAs from aim 1. N=89
- Used Computerized Language Analysis (CLAN) to identify verbs in Cinderella Story transcripts
- Paired samples t-test (2-tailed) conducted to determine whether the mean number of core verbs produced by PWAs differed from the number of core verbs produced by controls.
- Kruskal-Wallis test (and follow-up tests) conducted to determine if four subtypes of aphasia demonstrated different core verb usage.
- Multiple regression analysis performed to determine influence of imageability and lemma frequency on incidence in PWAs, as defined by number of persons producing the verb at least one time. Imageability was determined by MRC Psycholinguistic Database and lemma frequency was determined by The Corpus of Contemporary American English.
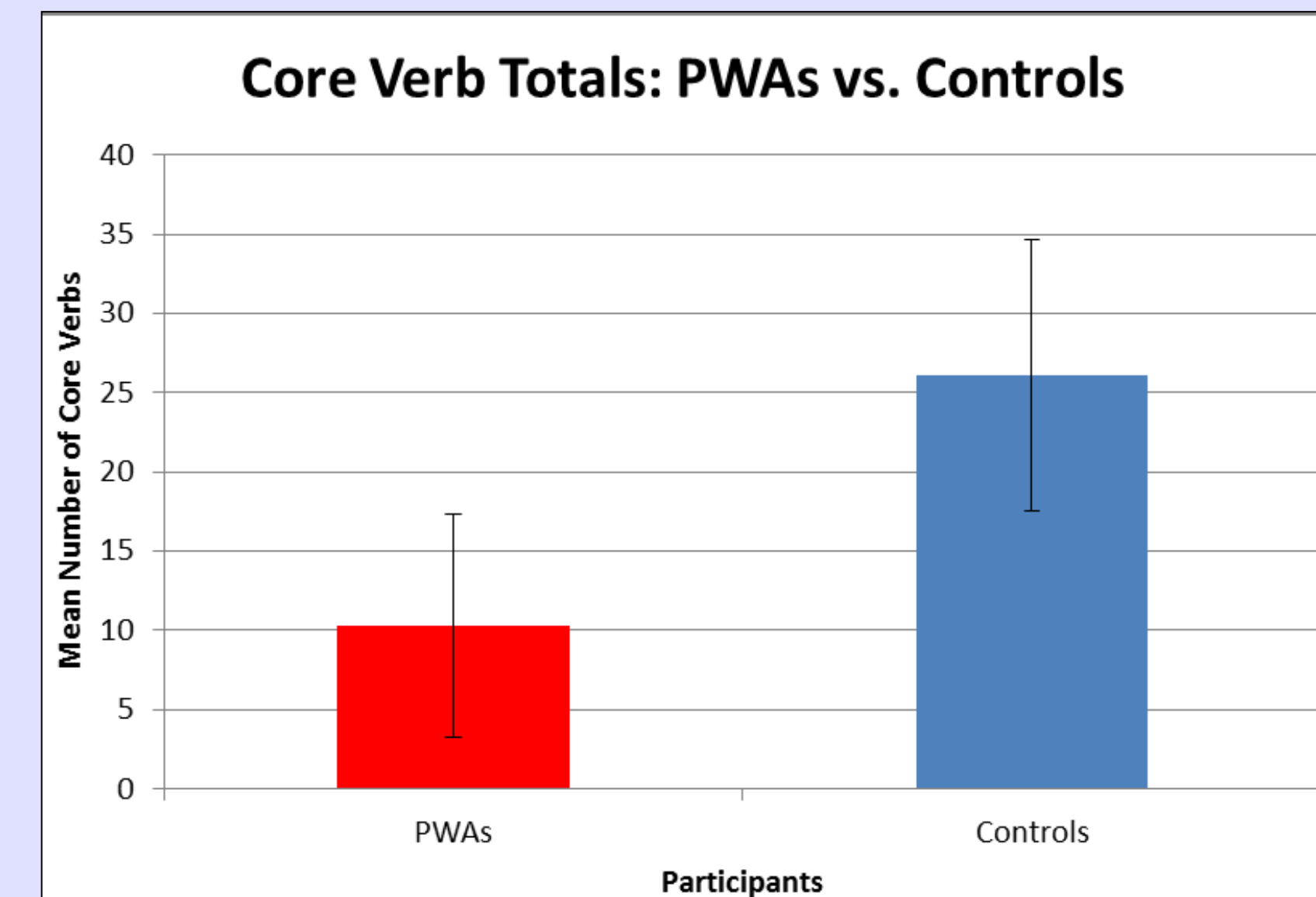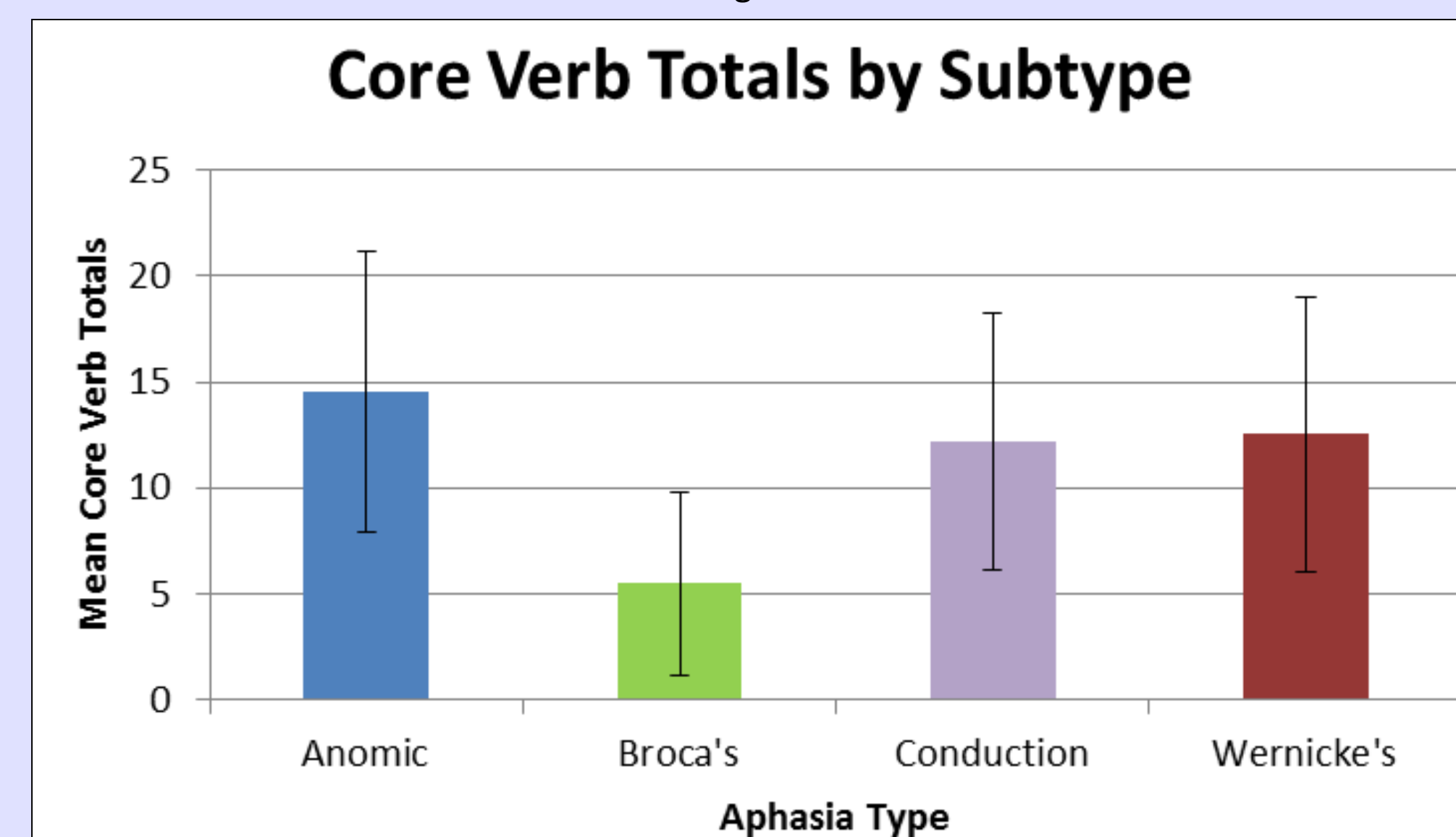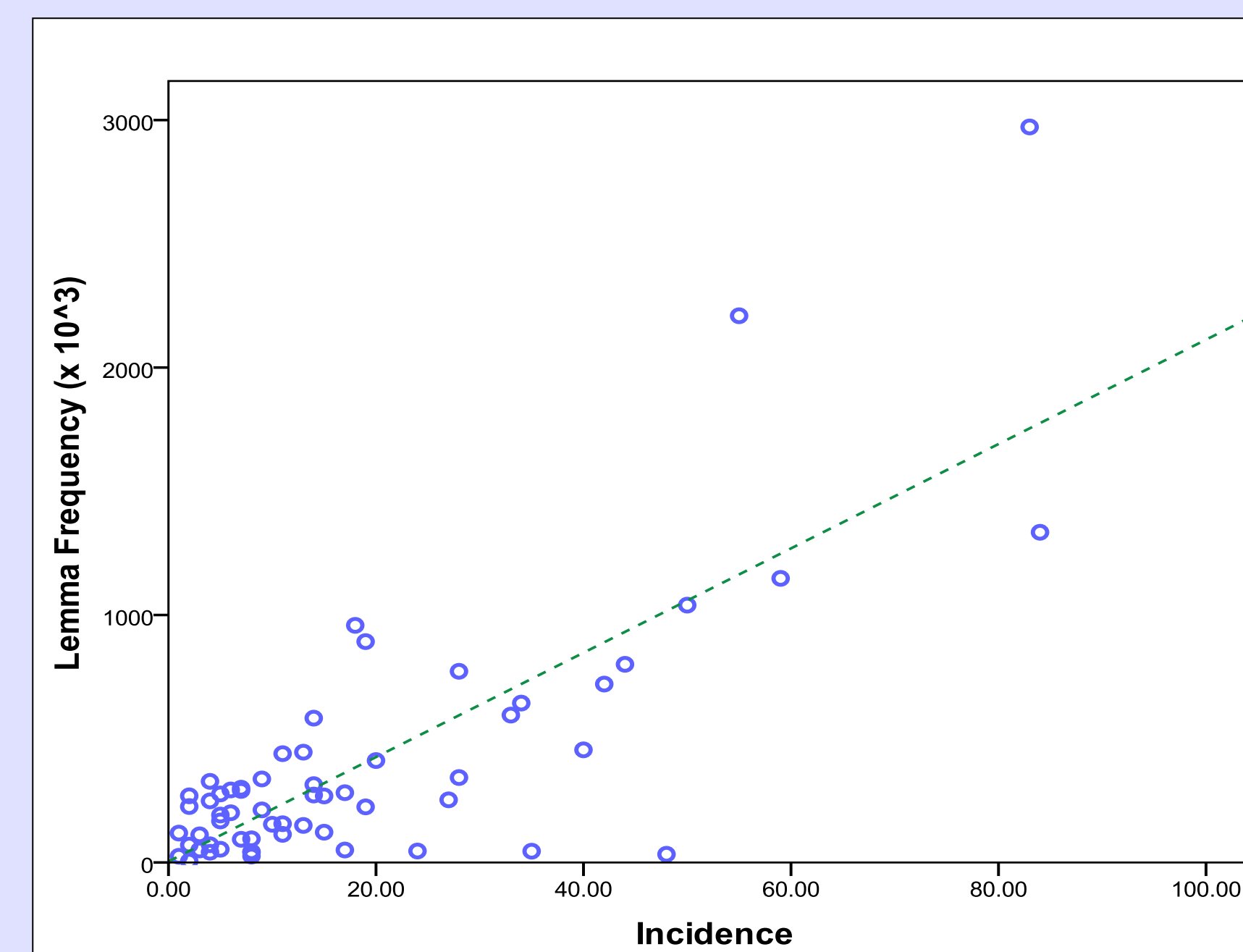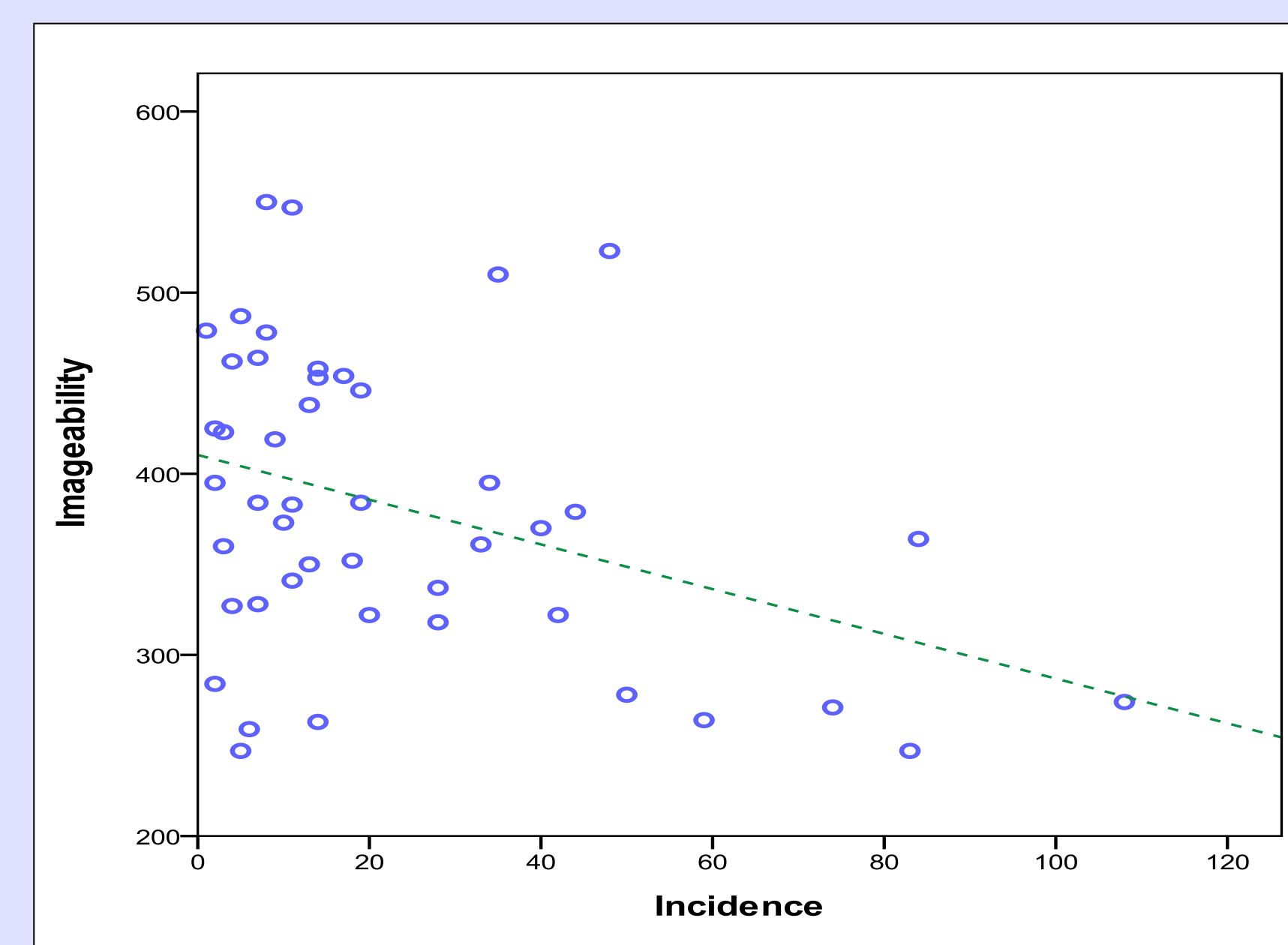

Figure 1

Figure 2

Figure 3

Figure 4

Results:

Aim 1: A paired samples t-test indicated significant differences in core verb usage between PWAs and controls, $t(88)=-13.58$, $p<.001$. Mean Verb Totals: PWAs= 10.31; Controls= 26.11 (Figure 1).

Aim 2: A Kruskal-Wallis test to determine differences in core verb usage between 4 subtypes of aphasia was significant, χ^2 (3,n=80)=23.51, $p<.001$. Follow-up Mann-Whitney U Tests results (Figure 2):
- Anomic vs. Broca's: $p<.001$*
- Anomic vs. Conduction: $p=.21$
- Anomic vs. Wernicke's: $p=.38$
- Broca's vs. Conduction: $p<.001$*
- Broca's vs. Wernicke's: $p=.002$*
- Conduction vs. Wernicke's: $p=.99$

*significant at .008 using Bonferroni approach to control for Type 1 error

Aim 3: A multiple regression revealed that either one or both factors (lemma frequency and imageability) are correlated with high verb incidence ($F=31.57$, $p<.001$, $R^2= .606$). 60.6% of the variance in the number of core verbs produced is explained by both the frequency and imageability of the word. A closer inspection using a step-wise function eliminated the imageability factor and showed that lemma frequency is significantly correlated with core verb incidence ($F= 62.31$, $p<.001$, $R^2=.597$). 59.7% of the variance in the number of core verbs produced is explained by the frequency the word. (Figures 3 and 4).

Conclusions:

- Individuals with aphasia produce less variety of verbs than do normal speakers during narration.
- Persons with non-fluent aphasia produce significantly fewer verbs than those with fluent types of aphasia.
- There is little variability in verb production between the fluent aphasia subtypes. Core verb use alone may not be able to predict whether or not PWAs are able to convey a coherent story.
- A verb's lemma frequency predicts production more than the verb's imageability in PWAs.
- Assessment of a core lexicon may be a quick way to determine narration adequacy and predict functional communication skills.

Future Directions:
- Investigate the relationship between core verb analysis and main concept/ main event analysis to determine whether the quick core verb analysis correlates strongly with the more thorough and time-intensive analysis of story coherence/cohesion.
- Analyze a large sample of discourse tasks available via AphasiaBank to reveal core verb lexicons for comparison.
- Continue to develop time-efficient methods of discourse analysis to equip clinicians and researchers practicable tools for measuring functional outcomes.

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