Nouns are more stable than Verbs: Patterns of semantic change in 19th century English

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Semantic Change
(Traugott & Dasher, 2002)

❖Words sometime change their meaning over time
  e.g., Old English 'deor' (animal) vs. Modern English 'deer'
❖Several types of change have been catalogued
(e.g., narrowing, pejoration)

Are some words more susceptible to semantic change than others?

The Verb Mutability Effect
(Gentner & France, 1988)

❖Verb interpretations are more affected by their contexts than noun interpretations.
  ❖Most verbs denote relations, most nouns denote objects
❖Verb meaning is more likely to change than noun meaning in a *semantically strained* sentence:

  "The lizard worshipped"

Are verbs more likely than nouns to undergo semantic change?

Measuring Semantic Change

❖**Latent Semantic Analysis**[4] statistically quantifies semantic meaning by representing each semantic entity (word, phrase, etc.) using a vector in multidimensional space
❖The *correlation* between two semantic vectors is a measure of their *semantic similarity*

The method

❖Generated a semantic space based on British and American literary works found in Project Gutenberg (~240 million words) using Infomap[5,6]
❖Calculated the semantic vector representing the context of each occurrence of the 500 most frequent content words for works by authors born in the 19th century.
  ❖The grammatical category of each word was determined using the MRC2.
❖Computed the average context vector for 25-year time periods for each word (based on the author's date of birth).
❖The *angles* between the vectors for the same word between different time periods were used as the basis for the analysis.

Hypothesis
Verbs change their meaning more over time than Nouns do

Semantic change over time:
Nouns vs. Verbs

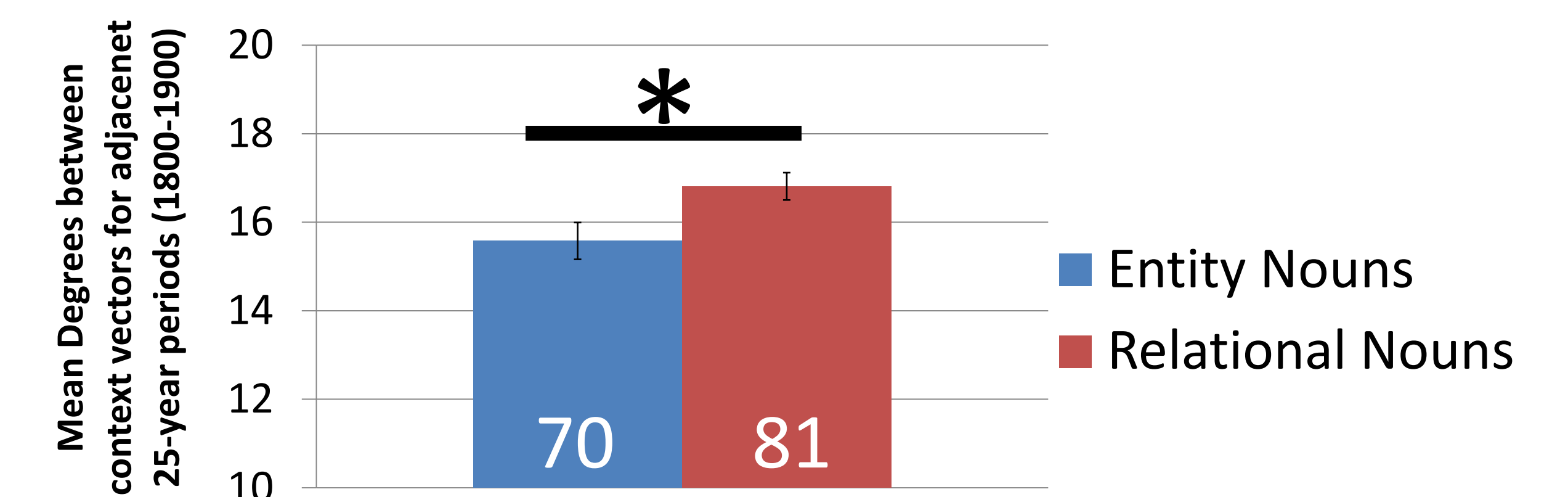Average angle for word context vectors by grammatical category.

Interaction: $F(1, 261) = 49.56$, $p < .001$
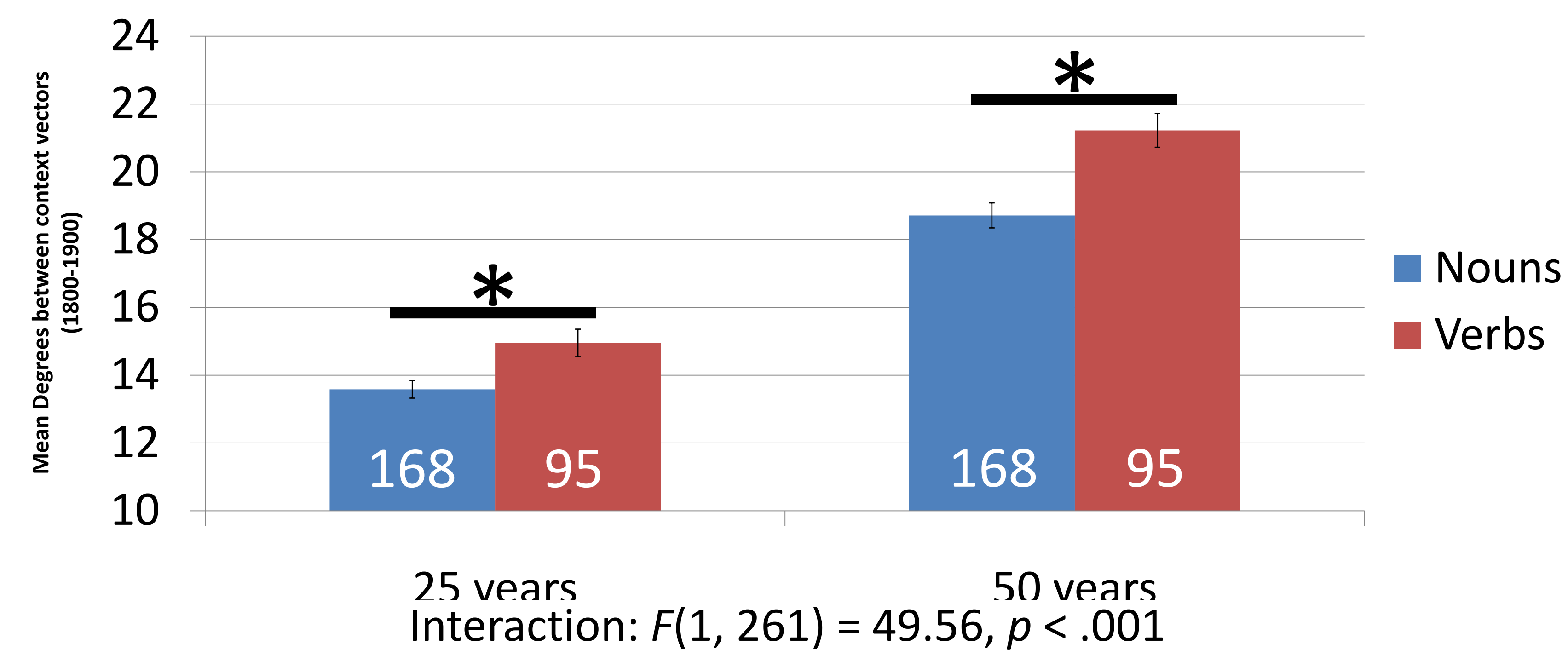
❖ Verbs exhibit more semantic change than nouns.
❖ This difference increases over time.

Possible sources for difference in rate of change:
Familiarity and Concreteness

Average angle for word context vectors by grammatical category and a median split based on the MRC2 familiarity and concreteness ratings.
No verbs had above-median concreteness and so only the low concreteness data is shown

❖ Low familiarity Nouns exhibit more change than high familiarity ones.
❖ This effect is not significant for verbs.
❖ No interaction was found.
❖ **Verbs exhibit more semantic change than Nouns regardless of familiarity or concreteness.**

Relationality:
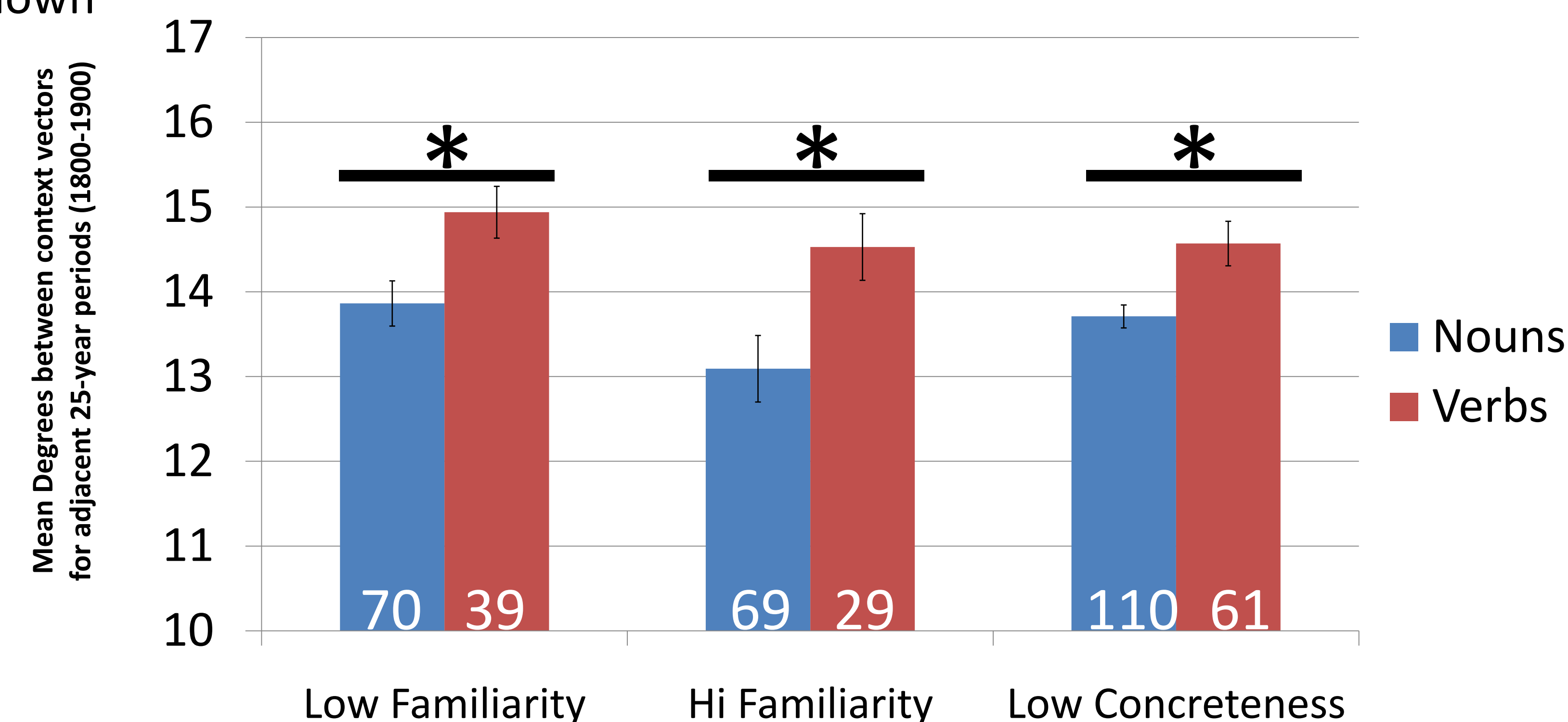### A contributing factor?
Entity vs. Relational nouns

❖The difference in mutability between verbs and nouns has an analog in nouns: *relational* and *entity nouns*[3].
❖A corresponding difference is expected in the rate of semantic change.
The graph below is based on lists of entity and relational nouns collected by Dedre Gentner and her colleagues.

❖ Similarly to verbs, relational nouns exhibit more semantic change over time than entity nouns.

Discussion

❖Semantic change is more pronounced in verbs than in nouns.
❖Mutability might be a contributing factor to semantic change.

Future Directions

❖Do verbs and nouns undergo the same *types* of semantic change?
❖Do relational nouns exhibit the *same* degree of semantic change as verbs?
❖What other factors affect the rate and likelihood of semantic change?

References
1. Traugott, E. C. & Dasher, R. B. (2002) *Regularity in Semantic Change*. Cambridge: Cambridge University Press.
2. Gentner, D., & France, I. M. (1988) The verb mutability effect: Studies of the combinatorial semantics of nouns and verbs. In S. L. Small, G. W. Cottrell, & M. K. Tanenhaus (Eds.), *Lexical ambiguity resolution: Perspectives from psycholinguistics, neuropsychology, and artificial intelligence* (pp. 343-382). San Mateo, CA: Kaufmann.
3. Asmuth, J. & Gentner, D. (2005) Context sensitivity of relational nouns. *Proceedings of the Twenty-seventh Annual Meeting of the Cognitive Science Society*, (pp. 163-168).
4. Deerwester, S., Dumais, S. T., Furnas, G. W., Landauer, T. K., & Harshman, R. (1990) Indexing by Latent Semantic Analysis. *Journal of the American Society for Information Science, 41*, 391-407.
5. Takayama, Y., Flournoy, R., Kaufmann, S. & Peters, S. (1999). Information retrieval based on domain-specific word associations. In Cercone, N. and Naruedomkul K. (eds.), *Proceedings of the Pacific Association for Computational Linguistics (PACLING'99)*, Waterloo, Canada. 155-161.
6. Infomap [Computer Software]. (2007) http://infomap-nlp.sourceforge.net/ Stanford, CA

Error bars in graphs represent standard error of the mean, number of words at bottom of bars.