Friedrich-Alexander-Universität
Philosophische Fakultät und
Fachbereich Theologie

How Random is a Corpus?

Topic 1.2.A Methodological issues and statistical analysis

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1. Topic Orientation

1.1 Seminar Review

1.2 Procedures of a Corpus Linguistics research

1.3 Topic key word

2. Randomness and Non-Randomness

2.1 Source of randomness

2.2 Sources of non-randomness

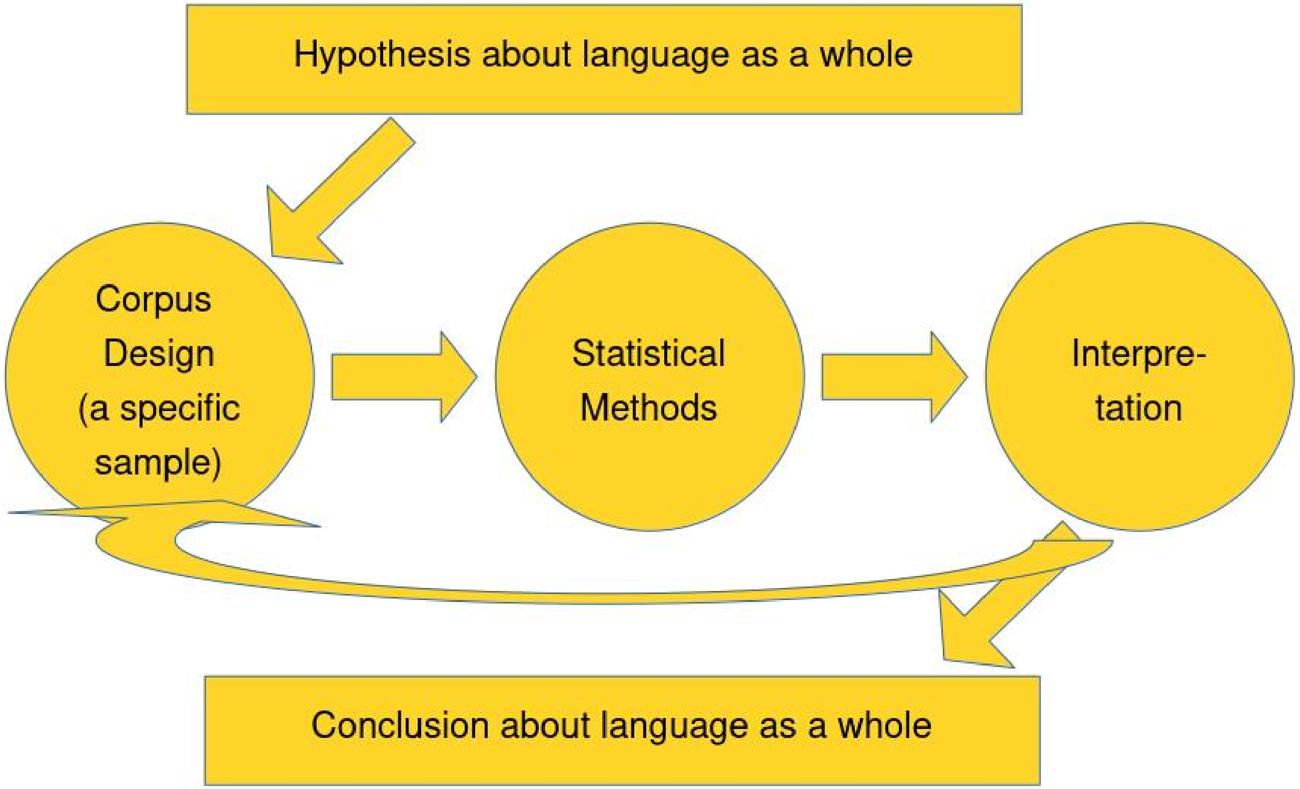
3. Conclusion

Seminar Review

What did we learn in this seminar?

- **Significance testing (Statistical methods)**
  - Null hypothesis, p-value, chi-square test
- **Corpus design**
  - Social media corpora
  - Spoken language corpora
- **Application of Corpus Linguistics (Results Interpretation)**
  - Critical discourse analysis
  - Translation studies
  - Pragmatic studies

Procedures of a Corpus Linguistics research



Hypothesis about language as a whole

Corpus Design (a specific sample)

Statistical Methods

Interpre-tation

Conclusion about language as a whole

Topic key word

Evert: Reflection of Statistical Methods in Corpus Linguistics

- *why should we apply statistical methods (based on the **random sample** model) at all?* (in corpus linguistics)
  - Evert, Stefan. "How Random is a Corpus? The Library Metaphor" Zeitschrift für Anglistik und Amerikanistik, vol. 54, no. 2, 2006, pp. 177-190.
- What does **Randomness** actually mean in Corpus Linguistics?
- Sources of **(non-)Randomness**: Corpus design
- Validating the **(non-)Randomness**: Results interpretation

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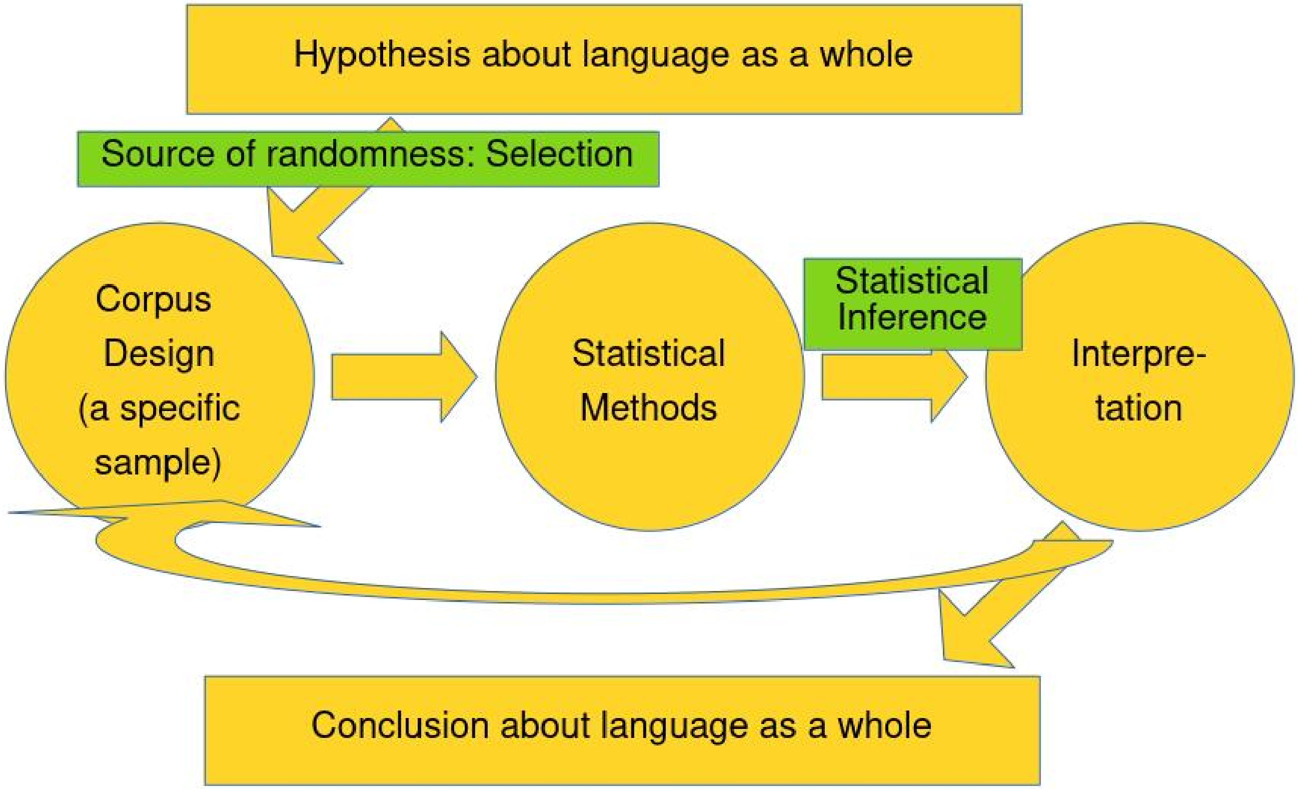
Source of randomness

The library metapher

- **A seeming conflict**
  - *statistical methods ... operate on random samples*
  - *very little (in language) is left to chance*
- **The library metapher**
  - *... there is nothing random about the text in the library: every senetence was produced for some specific purpose.*
  - *The selection of a particular corpus - picking an arbitrary book from one of the shelves*
  - *It is this choice which introduces an element of randomness into corpus frequency data.*
- **Why randomness?**
  - Statistical inference: Representativeness to (sub)language as a whole

Source of randomness

Illustrated in the procedures



Hypothesis about language as a whole

Source of randomness: Selection

Corpus Design (a specific sample)

Statistical Methods

Statistical Inference

Interpretation

Conclusion about language as a whole

Sources of non-randomness

Still not (completely) random?

- ***Balanced* samples**
  - **External** source of non-randomness
  - An issue of subjective language interpretation

- **The unit of sampling** vs. **the unit of measurement**
  - **Internal** source of non-randomness
  - Clustering effect: *a tendency to lump together*
  - Language is NOT a bag of random words

An evidence of internal non-randomness

Underestimated variation

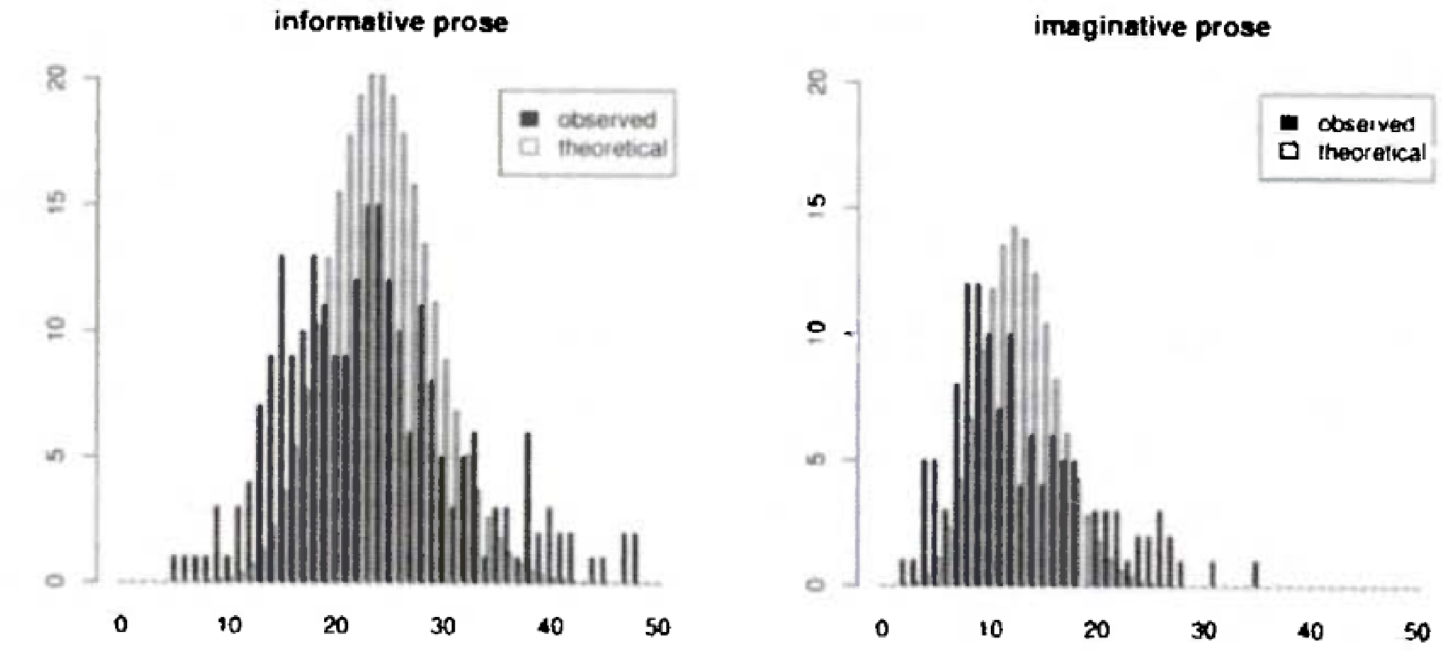


Figure 1: Empirical distribution (dark bars) of the frequencies of passive verb forms in the documents of the Brown corpus vs. theoretical binomial distribution (light bars) predicted by the random sample model

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Conclusion

Things that statistics won’t tell you.

- **Statistical methods and corpus design**
  - Statistics don’t show the quality of corpus design.
  - Conversely, the selection of texts provides the randomness (i. e. representativeness), which is the prerequisite of all statistical methods.
- **Statistical methods and interpretation**
  - Two sources of randomness may reduce the validity of statistical reference: Imbalanced sampling and clustering effect.
  - Real linguistic data usually have larger variation (an index of non-randomness) than theoretical expectation.

Thanks for your attention

How does the elephant look like?

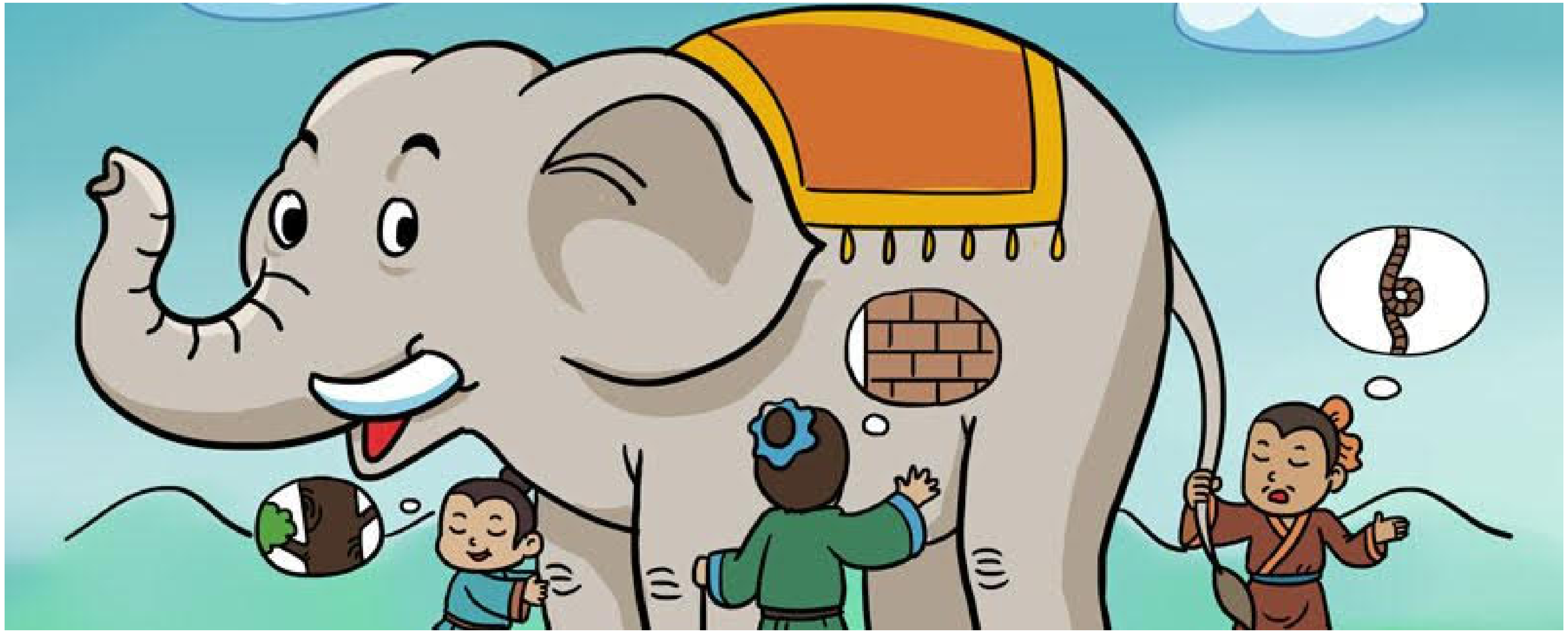

Figure: Blind people touch an elephant

References

[BE09] M. Baroni and S. Evert. “36. Statistical methods for corpus exploitation”. In: *Volume 2*. Ed. by A. Lüdeling and M. Kytö. Berlin, New York: De Gruyter Mouton, 2009, pp. 777–803. DOI: doi:10.1515/9783110213881.2.777.

[Eve06] S. Evert. “How Random is a Corpus? The Library Metaphor”. In: *Zeitschrift für Anglistik und Amerikanistik* 54.2 (2006), pp. 177–190. DOI: doi:10.1515/zaa-2006-0208.

[Ste20] A. Stefanowitsch. *Corpus linguistics: A guide to the methodology*. Textbooks in Language Sciences. Language Science Press, 2020.