

Chapter 6: Exercises

- 1) Which linguistic disciplines use the notion of 'style' as one of their core concepts? How can it be operationalized?
Style relates to variation in language due to external factors such as the speaker background or the situation. It can be operationalised through (sociolinguistic/stylistic/register-related) variables.

- 2) Which of these cases of variation satisfy Labov's definition of a sociolinguistic variable and can thus be investigated using Labov's methods? Justify your answer.
 - a) h-dropping in different social contexts: i.e. the variation between the pronunciation of e.g. the word 'hair' as /heə/ or /eə/. **YES – satisfies the definition of the two forms expressing the same meaning.**
 - b) The variation between naming strategies for soft drinks in the US, e.g. *soda*, *pop* or *coke*. (<http://popvsoda.com/>) **YES – satisfies the definition of the two forms expressing the same meaning.**
 - c) The variation between the active and the passive construction, e.g. *I did it* vs. *It was done*. **NO. Arguably, the meaning focus changes between the two constructions from the focus on the agent (active construction) to the focus on the fact or process (passive construction) where the agent is often not expressed (short passive without the by phrase).**
 - d) The variation between verbs expressing preferences with a different intensity, e.g. *adore*, *love*, *like* and *don't mind*. **NO. These forms have a different propositional meaning.**
 - e) The use of hedges in discourse and the variation between a hedged and unhedged utterance, e.g. *I sort of agree*. vs. *I agree*. **NO. The meaning (strength of assertion) is different.**

- 3) Look at the following ways of reporting the t-test, ANOVA and the Mann-Whitney U test. Identify erroneous or missing pieces of information.
 - a) $t = 2.77, p = .007, d = .69$.
[degrees of freedom and 95% CI missing]
CORRECT: $t(61.93) = 2.77, p = .007, d = .69, 95\% CI [.18, 1.21]$.
 - b) $F(56) = 5.59, p < .00201359$.
[2nd degrees of freedom and effect size missing, p-value has too many decimal places]
CORRECT: $F(3, 56) = 5.59, p = .002, \eta^2 = .432$.
 - c) $U = 705, p = 1.3$
[p-value outside of range and effect size missing]
CORRECT: $U = 705, p = .009, r_{tb} = -.19$.

- 4) Use the equations in this chapter to calculate the test statistics (i.e. not the p-values) for:
 - a) The use of *lovely* in male and female speech [t-test, Mann-Whitney U].
Male group ($n_1=10$): 0.91, 1.4, 2.18, 6.21, 2.63, 1.2, 0, 1.06, 6.49, 5.43; **Mean = 2.75, SD = 2.39**
Female group ($n_2=10$): 8.84, 1.09, 12.47, 1.65, 3.93, 1.1, 4.11, 21.21, 2.51, 0.47; **Mean = 5.74, SD = 6.65**

$$\begin{aligned} \text{Variance (male)} &= SD^2 = 2.39^2 = 5.72 \\ \text{Variance (female)} &= SD^2 = 6.65^2 = 44.25 \end{aligned}$$

$$\text{Welch's independent sample t - test} = \frac{\text{Mean of group 1} - \text{Mean of group 2}}{\sqrt{\frac{\text{Variance of group 1}}{\text{Number of cases in group 1}} + \frac{\text{Variance of group 2}}{\text{Number of cases in group 2}}}} = \frac{2.75 - 5.74}{\sqrt{\frac{5.72}{10} + \frac{44.25}{10}}} = -1.34$$

The t-test test statistic is: $t = -1.34$.

Now, let's calculate the Mann-Whitney U test:

Male group (ranks): 18, 13, 11, 5, 9, 14, 20, 17, 4, 6; sum = 117

Female group (ranks): 3, 16, 2, 12, 8, 15, 7, 1, 10, 19; sum = 93

$$\begin{aligned} U_1 &= \text{sum of ranks for group 1} - \frac{\text{cases in group}_1 \times (\text{cases in group}_1 + 1)}{2} \\ &= 117 - \frac{10 \times (10 + 1)}{2} = 62 \end{aligned}$$

$$\begin{aligned} U_2 &= \text{sum of ranks for group 2} - \frac{\text{cases in group}_2 \times (\text{cases in group}_2 + 1)}{2} \\ &= 93 - \frac{10 \times (10 + 1)}{2} = 38 \end{aligned}$$

For the Mann-Whitney U test we report the smaller of the two values as the test statistic, hence $U = 38$.

b) The use of *innit* in the speech of speakers from the South, Midlands and the North [one-way ANOVA].

South ($n_1 = 10$): 4.19, 29.29, 5, 30.43, 6.09, 12.77, 25.93, 0.61, 28.08, 15.94; mean = 15.83, SD = 11.71

Midlands ($n_2 = 10$): 9.68, 3.65, 1.2, 0, 2.07, 2.26, 5.18, 0, 0, 0; mean = 2.40, SD = 3.11

North ($n_3 = 10$): 9.09, 9.09, 0, 7.38, 0, 5.77, 0, 4.47, 0, 3.23; mean = 3.90, SD = 3.82

Grand mean: 7.38

Between – group variance

$$\begin{aligned} &= \frac{\text{cases group 1} \times (\text{mean}_1 - \text{grand mean})^2 + \text{cases group 2} \times (\text{mean}_2 - \text{grand mean})^2 + \dots}{\text{number of groups} - 1} \\ &= \frac{10 \times (15.83 - 7.38)^2 + 10 \times (2.4 - 7.38)^2 + 10 \times (3.9 - 7.38)^2}{3 - 1} = 541.52 \end{aligned}$$

Within – group variance

$$\begin{aligned}
 &= \frac{\text{df} \times \text{sum of squared distances for group 1} + \text{df} \times \text{sum of squared distances for group 2} + \dots}{\text{number of cases} - \text{number of groups}} \\
 &= \frac{(10 - 1) \times SD_1^2 + (10 - 1) \times SD_2^2 + (10 - 1) \times SD_3^2}{30 - 3} \\
 &= \frac{9 \times 11.71^2 + 9 \times 3.11^2 + 9 \times 3.82^2}{27} = 53.82
 \end{aligned}$$

$$\text{One – way ANOVA (F)} = \frac{\text{Between group variance}}{\text{Within group variance}} = \frac{541.52}{53.82} = 10.06$$

The ANOVA test statistic is: $F = 10.06$.

5) Calculate Cohen's d for the dataset a) in Question 4.

$$\begin{aligned}
 \text{pooled } SD &= \sqrt{\frac{SD1^2 \times (\text{cases in group1} - 1) + SD2^2 \times (\text{cases in group2} - 1)}{\text{all cases} - 2}} = \sqrt{\frac{2.39^2 \times (10 - 1) + 6.65^2 \times (10 - 1)}{20 - 2}} = 5.00 \\
 \text{Cohen's } d &= \frac{\text{Mean of group 1} - \text{Mean of group 2}}{\text{pooled } SD} = \frac{2.75 - 5.74}{5} = -0.60
 \end{aligned}$$

The effect size measure (Cohen's d) is -0.6, which is medium effect in standard interpretation Cohen (1988: 40).

6) -

7) Interpret the following correspondence plot. It is based on BNC64, a corpus of informal British speech. 16 male and 16 female speakers are plotted in the graph according their use of different semantic types of certainty markers (*certainly, maybe, perhaps, possibly, etc.*) Each speaker is labelled according to their gender (F1a and M1a), number identifier (F1a) and sample number (F1a, F1b); there are two samples per speaker.

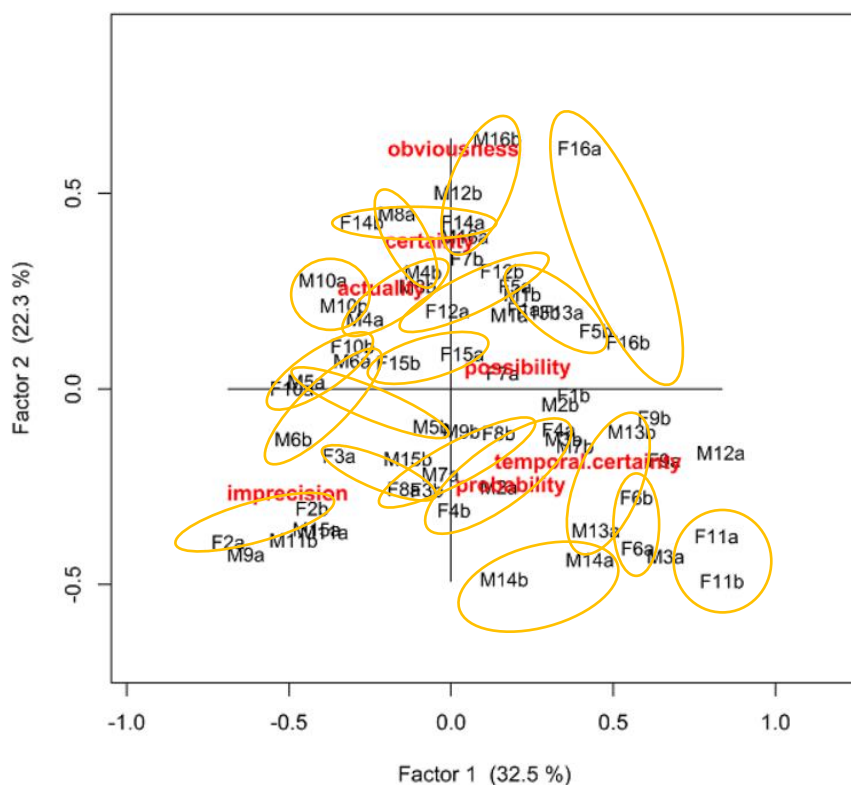


Figure 6.12 Correspondence analysis: Use of epistemic markers in BNC64

Overall, the correspondence analysis explains 54.8% (22.3% + 32.5%) of variation in the data. The individual speaker samples (a and b) tend to cluster together showing preferences for a specific types of certainty markers in individual speakers' speech.

- 8) Interpret the following output from the mixed-effects model technique; the linguistic variable is the use of *must* competing with other strong modal terms such as *have to* and *need to* in different genres of British and American English.

The model controls for individual text as a random effect. Moving on to the statistically significant fixed effects, *must* is dispreferred in fiction and newspapers and with *I* and *you* subjects – N. B. the negative Estimates.

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      AIC      BIC   logLik deviance df.resid
2412.3    2456.9  -1198.1  2396.3    1943

Scaled residuals:
   Min       1Q   Median       3Q      Max
-1.9037 -0.6202 -0.3895  0.7452  2.4673

Random effects:
 Groups Name   Variance Std.Dev.
Text (Intercept) 1.52    1.233
Number of obs: 1951, groups: Text, 743

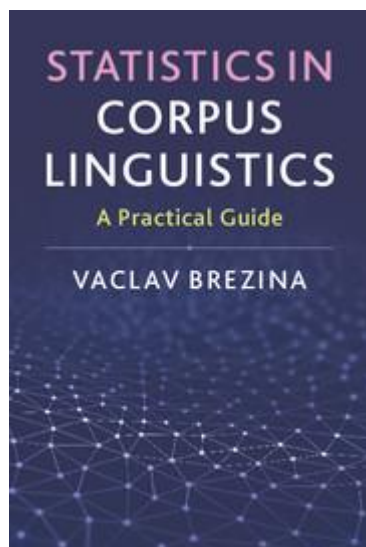
Fixed effects:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)    0.1783    0.2364   0.754 0.450635
VarietyB_BR    0.1567    0.1515   1.034 0.300982
GenreB_Fiction -0.9825    0.2717  -3.616 0.000299 ***
GenreC_General -0.2894    0.2569  -1.126 0.259977
GenreD_Press  -0.7682    0.2920  -2.631 0.008511 **
SubjectB_I     -1.1864    0.2153  -5.511 3.58e-08 ***
SubjectC_you   -0.8857    0.2030  -4.363 1.29e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
    
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- 9) *Do men swear more than women?* Use the BNC64 Search & Compare tool (corpora.lancs.ac.uk/bnc64) to test different socio-linguistic hypotheses about swearing in informal British speech. Pay attention to the different statistical measures and their interpretation.

Table 6.5 Swearing and gender: BNC64

Swear word	Statistically significant result?	Meaningful difference?
1. <i>fucking</i>	NO; $U = 452.5, p > .05$	The difference is related primarily to age, not gender.
2. <i>hell</i>	NO; $U = 421, p > .05$	Ditto
3. <i>shit</i>	NO; $U = 440, p > .05$	Ditto
4. <i>cunt</i>	NO; $U = 475.5, p > .05$	Ditto

Further (multi-variate) exploration is possible with [BNClab](#). This tool provides access to much larger corpus; with more evidence (data) some statistical comparisons can turn statistically significant.



Brezina, V. (2018). [*Statistics in Corpus Linguistics: A Practical Guide*](#). Cambridge: Cambridge University Press.

Do you use language corpora in your research or study, but find that you struggle with statistics? This practical introduction will equip you to understand the key principles of statistical thinking and apply these concepts to your own research, without the need for prior statistical knowledge. The book gives step-by-step guidance through the process of statistical analysis and provides multiple examples of how statistical techniques can be used to analyse and visualise linguistic data. It also includes a useful selection of discussion questions and exercises which you can use to check your understanding.

The book comes with a Companion website, which provides additional materials (answers to exercises, datasets, advanced materials, teaching slides etc.) and [Lancaster Stats Tools online](#), a free click-and-analyse statistical tool for easy calculation of the statistical measures discussed in the book.