Processing noncanonical word order in Czech
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Abstract

In relatively few word order languages like Finnish and Hindi, when discourse context is not provided, deviating from canonical order results in increased processing difficulty (Hyönä and Hujanen 1997). However, it has been recently shown that in such relatively few word order languages, discourse context can facilitate the processing of noncanonical order (e.g., Kaiser and Trueswell 2004). These constraints also seem to apply in languages with not as few a word order, such as English. Altman and Steedman (1988), it is nevertheless possible that in languages like Czech, which have even fewer word order than Finnish and Hindi, the relatively high frequency of noncanonical orders (Krajíř-Korabová et al. 2003) could have the consequence that processing is not adversely affected by noncanonical order even without any supporting discourse context. We present a self-paced reading study involving Czech which shows that the absence of discourse context does not necessarily have an adverse effect on noncanonical order processing: a critical cross-linguistic variable is the degree of word order freedom available a priori. Languages with fewer word order do not suffer the effects of noncanonical order to the extent that comparatively rigid order languages do.

Introduction

Noncanonical order is harder to process than canonical. The Hyönä and Hujanen (1997) Finnish eye-tracking experiment:

(1) a. Finally politics destroys the flexibility in decision-making.

b. Finally politics destroys the continuously growing body of non-voters

Greater processing difficulty was observed in object-first sentences than subject-first.

But preceding context can neutralize this difficulty. The Kaiser and Trueswell (2004) Finnish self-paced reading experiment:

Context Sentences:

(2) Yesterday, Lotta looked for mushrooms in the forest. She noticed a mouse/hare in the grass that was carefully moving forward.

Target Sentences:

(3) a. The mouse followed the hare and birds were singing.

b. The hare followed the mouse and the birds were singing

‘When a discourse was established that satisfied the referential presuppositions of the noncanonical (OVS) structure, reading times for the noncanonical structure were only slightly larger than for the canonical (SVO) version, with the significant effect being isolated to the verb.’ (Kaiser and Trueswell 2004, 16)

Similar results exist for German (Weber and Nen 2003) and for Hindi (Vasishth 2000a,b).

Equivalence testing (two one-way t-tests)

In equivalence tests (specifically, two one-sided t-tests or TOST), the null hypothesis is treated as the alternative hypothesis, and vice versa.

\[ H_0 : d \leq \theta_L \text{ or } d \geq \theta_U \] (1)

\[ H_0 : \theta_L < d < \theta_U \] (2)

where \( \theta \) is an equivalence threshold -- a range below which any difference of means amounts to effective equivalence.

Having defined \( \theta \), the following two t-tests are carried out, and if both reject the null hypothesis, we have shown effective equivalence of means.

\[ t = \frac{d - \theta}{SE} \] (3)

\[ t = \frac{d + \theta}{SE} \] (4)

Results

Assuming that a difference of less than 25 milliseconds (i.e., \( \theta = 25 \) msec) amounts to effective equivalence, the results show that there is effectively no difference in processing time at position V2 with agents-before-patient versus patient-before-agent order (only SVO vs. OVS was inconclusive using TOST).

Testing for the null hypothesis

In order to argue for the null hypothesis, we did not use the commonly used test (for a recent example see Giodano et al., 2003, 103)) and recommended technique of comparing so-called “observed power” along with posterior because this has been shown by Hoeting and Hayes (2001) to be an incorrect use of power.

It is a fallacy to assume that, in the face of a null result from a t-test or ANOVA, high power (say, greater than 0.80) provides grounds for accepting the null hypothesis: a nonsignificant p-value entails low observed power (see Hoeting and Hayes 2001 for details).

Consequently, we used a statistical technique called equivalence testing Berger and Hsu (1996), which is commonly used in the pharmaceutical industry to demonstrate, for FDA approval, effective equivalence of brand-name versus generic drugs.

Discussion

The absence of discourse context does not necessarily have an adverse effect on noncanonical order processing: a critical cross-linguistic variable is the degree of word order freedom available a priori. Languages with relatively few word order do not suffer the effects of noncanonical order to the extent that comparatively rigid order languages do.

References


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