Testing the Endoskeletal Hypothesis in English/German bilingual code-switching

Toby S. Lowther
Faculty of Linguistics, Philology and Phonetics, University of Oxford, UK

https://doi.org/10.36505/ExLing-2022/13/0030/000572

Abstract

In this paper, I report an experiment which provides preliminary evidence in favour of the Endoskeletal Hypothesis with respect to word order constraints on subordinate clauses in English-German bilingual sentences. The debate between exoskeletal (structure-driven) and endoskeletal (lexically-driven) models of syntax remains a contentious issue in contemporary syntactic theory, yet there has been no theory-neutral attempt to distinguish between the predictions of these two models. In this study, I utilise the unique opportunity presented by bilingual code-switched sentences to test the predictions of these two hypothesis against speaker judgements. The results of this experiment provide preliminary evidence in favour of the Endoskeletal Hypothesis (EnH).

Keywords: Syntax, bilingualism, code-switching, Endoskeletal Hypothesis

Introduction

Within syntax, the merits of exoskeletal approaches (associating grammatical properties with structures) and endoskeletal approaches (associating grammatical properties with words) to syntax remain a contentious debate (Borer 2003). However, no prior experimental work has tested these hypotheses in bilingual contexts, which provide a unique opportunity to draw apart their empirical predictions.

In the present study, I examined these differing experimental predictions through the lens of speaker judgements regarding word order in subordinate clauses in English-German bilingual sentences. In subordinate clauses, English exhibits VO word order, while German has OV word order. Participants' preferences regarding word order can therefore tell us which set of syntactic constraints is being used in a given bilingual construction. The null hypothesis (H_0) was that word order preference is unconditioned by linguistic context, varying by individual idiolect. I had two alternative hypotheses: that word order preference varied with the language of matrix clause and complementiser (H_1), as predicted by functional exoskeletal approaches; or that word order preference varied with the language of the embedded verb (H_2), as predicted by endoskeletal approaches The results of the study indicate that the Endoskeletal Hypothesis (EnH) holds true with respect to word order constraints in subordinate clauses in English-German bilingual code-switched (CS) sentences.

ExLing 2022 Paris: Proceedings of 13th International Conference of Experimental Linguistics, 17-19 October 2022, Paris, France

Methodology

Participants were recruited using the online recruitment service Prolific (www.prolific.co)[accessed 24.06.2021] and paid for their participation. A total of 79 participants completed the survey. Of these participants, 25 (31.6%) reported at least one parent speaking English at home, with 56 (70.9%) reporting at least one German speaking parent.

The study was composed of a sentence judgement task and a forced choice task (see Schütze and Sprouse 2013). The sentence judgement task involved rating written bilingual English-German sentences on a 5-point Likert scale ranging from 1 (a fully acceptable sentence) to 5 (a fully unacceptable sentence). In the forced choice task, participants were presented with the matrix clause, complementiser, and embedded subject of an English-German bilingual sentence, and asked to select one of two continuations or 'neither of the above'.

A total of 94 stimuli were prepared for the sentence judgement task (10 practice sentences, 56 test sentences, and 28 filler sentences). For the forced choice task, a total of 70 stimuli were prepared (10 practice sentences, 32 test sentences, and 28 filler sentences). Stimuli were pseudo-randomly allocated to four lists per task using a Latin square method. Each participant was presented with a single list for each task, resulting in 98 responses per participant (a total of 7,742 responses, of which 1,738 were test sentences).

The experiment was scripted in HTML and JavaScript for Ibex, and hosted on IbexFarm (spellout.net/ibexfarm)[accessed 01.07.2021, now defunct]. Tasks were completed successively. All sentences were presented visually, and participant responses as well as response times were recorded.

The data for the sentence judgement task were analysed using a linear mixed model fit by REML, modelling response score by linguistic condition, controlling for participant and test item. Interaction effects were examined with pairwise comparisons, using the Kenward-Roger degrees-of-freedom method and the Tukey method for p-value adjustment. In addition, summary statistics show significant outliers in response time, so I excluded high outliers for RT, using a Q3+(1.5*IQR) level filter as proposed by Tukey (1977).

For the forced choice task, an initial generalised linear mixed model failed to converge. I therefore used a multinomial logistic regression model fit with a neural network, modelling categorical response value by linguistic conditions. P-values were calculated with Wald tests, and this model was analysed under pairwise comparisons.

Results

Sentence Judgement Task

Visualisation showed a preference for VO order with English embedded verbs, and no clear word order preference with German embedded verbs.

The linear model showed a significant main effect for word order ($t = -5.186$, d.f. = 1,014, $p < 0.0001$), and interaction effects for matrix clause language by word order ($t = -5.354$, d.f. = 1,014, $p < 0.0001$) and embedded clause language by word order ($t = -4.258$, d.f. = 1,014, $p < 0.0001$). Pairwise comparisons confirmed that participants preferred a VO order with embedded English verbs ($p < 0.01$), and no significant preference for word order with a German embedded verb ($0.345 < p < 0.834$). In 'language-heavy' contexts where both the matrix clause language and dependent language variables differed from the embedded verb, the inverse pattern was observed: an English embedded verb in a German-heavy context showed no word order preference ($p = 0.438$), while a German embedded verb in a German-heavy context showed a preference for VO order ($p < 0.0001$).

Forced Choice Task

Visualisation showed a similar pattern to the previous task, except German embedded verbs seem to show a preference for OV order (see figure 1).

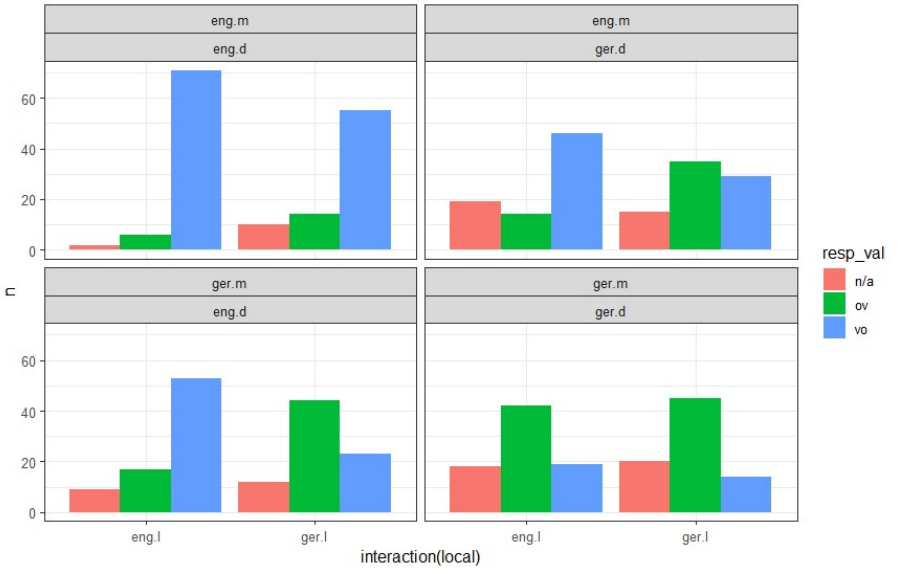

Figure 1. Bar chart for forced choice task frequency of response by condition, grouped by matrix clause language and dependent language.

Pairwise comparisons on the multinomial logistic regression model confirmed the patterns observed in figure 1. With an English embedded verb, participants preferred a VO word order (p-values ranging from 0.0084 to < 0.0001). In the German case, the data are less clear – a clear preference for OV is observed in the German monolingual case ($p = 0.0001$), while the results for cases with German embedded verb and either a German matrix clause or

German dependents are not significant ($p = 0.509$, $p = 0.988$). Similarly, to the sentence judgement task, 'language-heavy' contexts show the opposite pattern, with a strong preference for VO in English-heavy contexts despite a German embedded verb ($p = 0.0005$) and no preference in German-heavy contexts despite an English embedded verb ($p = 0.198$).

Discussion

The results of this study suggest that verb phrase word order constraints in subordinate clauses in English-German bilingual sentences are typically determined by the embedded verb that heads the verb phrase, i.e., that the EnH holds true. The data from 'language-heavy' contexts suggest that speakers treat a single lexical item in an otherwise monolingual sentence as a case of spontaneous borrowing, rather than true CS, with predictable syntactic differences. As participant judgements appear to follow an endoskeletal pattern, and assuming an appropriate relationship between linguistic judgements and linguistic competence, these results suggest that exoskeletal theories of syntax (such as neoconstructivist and cartographic approaches) are not psychologically plausible: they model linguistic competence as acting in a way which is not replicated by the psychological behaviour of speakers in the context of the present experiment. Thus, this study provides an important contribution, bringing experimental data and quantificational methods to bear on a fundamental question of syntax through the lens of bilingualism.

Acknowledgements

This research was funded with support from the ESRC Grand Union Doctoral Training Partnership and Balliol College, Oxford. My particular thanks to my supervisor, Dr. Louise Mycock, and to Drs. Matthew Husband and Diego Krivochen. This work would not have been possible without the critical support of Lara Scheibli, my native speaker informant in preparing stimuli.

References

Borer, H. 2003. Exo-skeletal vs. endo-skeletal explanations: Syntactic projections and the lexicon. In Moore, J. C., Polinsky, M. (eds.) 2003, The Nature of Explanation in Linguistic Theory, 31-67. Stanford, CSLI.

Schütze, C.T., Sprouse, J. 2013. Judgement data. In Podesva, R. J., Sharma, D. (eds.) 2013, Research methods in linguistics, 27-50. Cambridge, Cambridge University Press.

Tukey, J.W. 1977. Exploratory data analysis. Boston Mass., Addison-Wesley.