A Statistical Association between Head-Complement Orders and Word-Stress Location

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The correlation between morphosyntax and phonology has been one of the exciting but controversial topics in linguistic typology. Especially, it has been pointed out that languages with lefthand word-stress have head-final order (e.g. object-verb) while languages with righthand word-stress have head-initial order (e.g. verb-object) (Bally 1944, Lehmann 1973, Donegan and Stampe 1983). However, there has been no statistical analysis of the correlation with database in the world's languages. In this paper, we show our analysis of the word order data in Dryer (2008) and the word-stress data in Goedemans and van der Hulst (2008).

A statistical approach was taken to assess factors influencing on the head-complement orders in the language genera of the world. Using a dataset of 890 cases extracted from WALS Online (2008), we conducted a multinomial logistic regression analysis whose response variable was the observed head-complement order: head-initial, head-final, and either order being equally possible. The explanatory variables were the head-complement types (affix-stem, noun-genitive, adposition-NP, verb-object, and adverbial subordinator-clause) and three features of word-stress location: the fixedness (fixed/weight-sensitive), directionality (left/right), and the size of stress window (the maximal number of syllables to be searched from the relevant word-boundary).

The results of our statistical analysis show that head-complement type is the most important factor influencing on their order, as indicated by the smallest *p*-value of log-likelihood ratio test in Table 1.

Furthermore, we can see a clear increase of the proportion of head-initial order accordingly as the categorical hierarchy gets higher from affix-stem to adverbial subordinator-clause (Figure 1).

Our analysis confirms that two variables relating to word-stress placement are also significant determinants of head-complement order. As indicated in Table 1, head-complement order is strongly associated with the directionality of stress location: the genera with righthand word-stress show much higher proportion of head-initial order than those with lefthand one (Figure 2).

Weight-sensitive stress has turned out to be explanatory as well, having the effect of increasing the proportion of head-final order, compared with fixed stress (Figure 3).

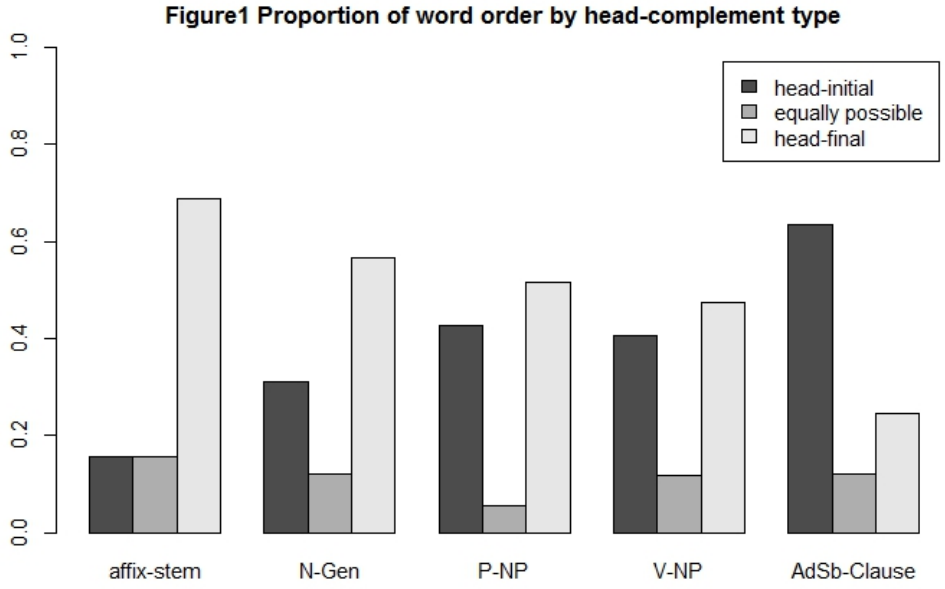
The factor of stress window, although explanatory in isolation, did not remain explanatory in our main effect model.

These statistical findings are explained as follows. Constituents with head-final order are more tightly connected than constituent with head-initial order. Head-initial constituents may contain head-final constituents, but not vice versa (cf. Biberauer et al. 2008). This explains why the rate of head-initial orders against head-final orders increases as complement gets larger.

Assuming that stress universally falls on complement rather than head (Nespor and Vogel 1986 and Cinque 1993), head-final (complement-left) constituents must have stress on the left. Head-final constituents are (compound) word-like because of its strong juncture. Then, lefthand stress in head-final constituent must match lefthand word-stress. Weight-sensitive stress is more flexible in stress location than fixed stress. Thus, we can explain why word stress correlates with head-complement orders. (499 words)

Table 1 The overall effect of the explanatory variables

Variable	LR chi^2	df	p-value
head-complement type	90.11	8	4.441e-16
lefthand/righthand word-stress	36.49	4	2.290e-7
fixed/weighted stress	9.63	2	0.008
stress window	2.70	2	0.259



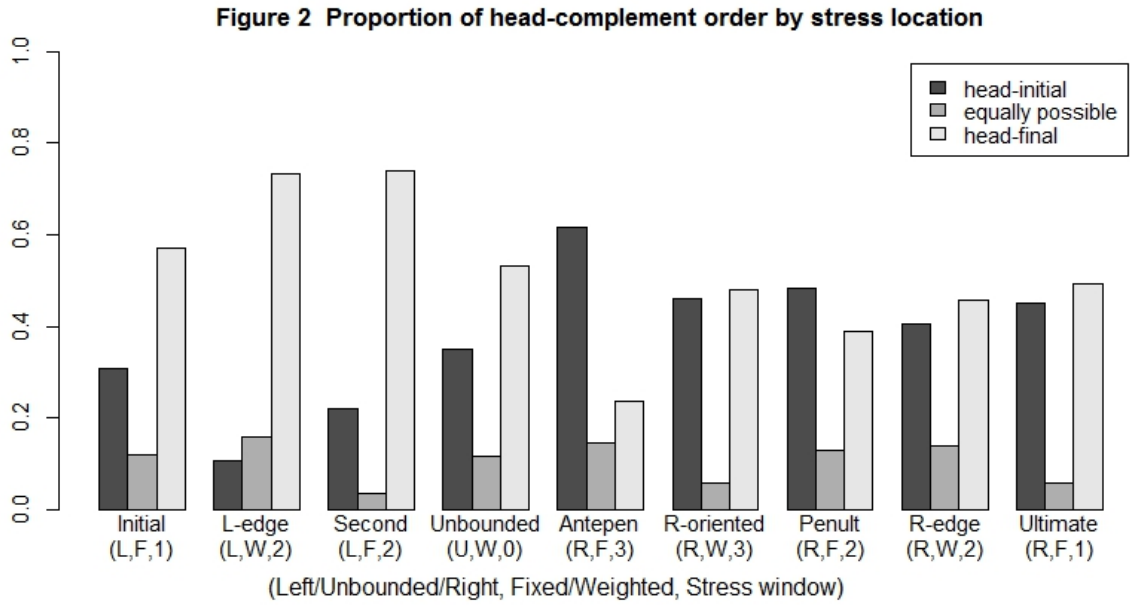


Figure3 Proportion of head-complement order by fixed/weighted stress