Frequency modulates structural choices
in Turkish non-local derivational morphemes

Eva Neu[1], Utku Turk[2], Özge Bakay[1], Brian Dillon[1], Gaja Jarosz[1]   [1]*UMass Amherst,* [2]*UMD*

Puzzle: Suspending Derivational Suffixes

- **Suspended affixation** (SA): a suffix on one conjunct scopes over all coordinated elements; highly productive with inflectional suffixes in Turkish

(1) [Ali ve Ayşe]-**ye** bak-tı-m.
     [Ali and Ayşe]-**DAT** look-PST-1SG
     'I looked at Ali and Ayşe.'

- SA with **derivational affixes**: limited productivity, considerable interspeaker and inter-item variation, not only isolated idioms (Akkuş, 2016, *pace* Kabak, 2007; Kornfilt, 2012)

(2) a. *[don-dur-up   kızar-t]-**ma**
         [freeze-CAUS-and roast-CAUS]-**RESULT**
         Intended: 'ice cream and roast meat'
     b. [ana   ve   baba]-**lık**
         [mother and father]-**DER**
         'mother- and fatherhood'
     c. [beş lira ve on dolar]-**lık** banknot-lar
         [five lira and ten dollar]-**DER** banknote-PL
         '5-lira and 10-dollar banknotes'

Research question

What determines the acceptability of derivational SA? How to account for the difference between inflectional and derivational SA?

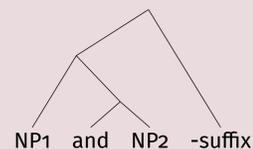## Our study: Manipulating frequency of coordination

Empirical finding

- With some derivational affixes, the acceptability of SA depends on the frequency of the coordinated phrase
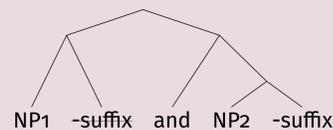
Analysis

- SA is **structurally ambiguous** between two syntactic parses:

(3) **Base generation**   (4) **Ellipsis**

NP1 and NP2 -suffix   NP1 -suffix and NP2 -suffix

- Frequency effect can be derived from **two assumptions**:

1. Derivational morphemes can only participate in SA under a basegeneration analysis
2. High-frequency coordinations bias the parser towards a base generation analysis (see also Morgan & Levy, 2015, 2016)

Key claim

Frequency of coordinations modulates the acceptability of derivational SA by increasing the availability of a base generation parse.

Further questions

- Why don't all derivational affixes behave alike?
- Why exactly is the ellipsis parse blocked for some affixes? Can we find independent evidence for this?

Experiment

Methods

- Acceptability judgment task for coordinated nouns with derivational affixes with and without SA on a 6-point Likert scale
- 2x4 within-subject design, crossing SA and SUFFIX TYPE
- Suffixes: *-cI* '-maker', *-lI* '-having', *-lIk* '-for' or *-sIz* '-less'
- Frequency counts of coordinated phrases ranging from 131,657 to 1 (taken from a Turkish Web 2012 corpus with ~3.4 billion words)
- N=47, 32 experimental items, 64 fillers

| SUFFIX	Sentence
-cI '-maker'	Selin tamir için kapı(-cı) ve pencere-ci bir marangozla anlaşmış.
	S. repair for door-MAKER and window-MAKER a carpenter made.a.deal.with
	'Selin agreed with a door-maker and window-maker carpenter for the repair.'
-lI '-having'	Selin tamir için kapı(-lı) ve pencere-li bir atölye hazırlamış.
	S. repair for door-HAVING and window-HAVING an atelier prepared
	'Selin prepared an atelier with a door and a window for the repair.'
-lIk '-for'	Selin tamir için kapı(-lık) ve pencere-lik bir desen seçmiş.
	S. repair for door-FOR and window-FOR a pattern chose
	Selin chose a pattern for a door and a window for the repair.
-sIz '-less'	Selin tamir için kapı(-sız) ve pencere-siz bir atölye hazırlamış.
	S. repair for door-LESS and window-LESS an atelier prepared
	'Selin prepared an atelier without a door or a window for the repair.'

Form — Full — SA
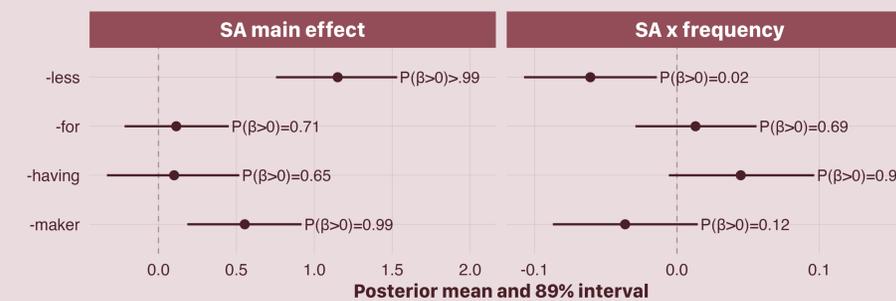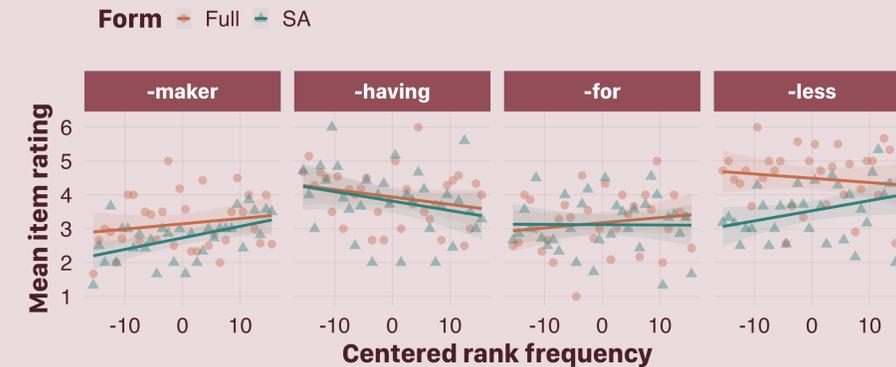
- Full forms are rated above SA forms throughout, with varying degrees of SA penalty across suffixes.
- The ordinal brms fit confirms suffix-specific SA effects; with the clearest frequency-sensitive posterior for *-less*; weaker or mixed results for others.
- Surface ratings and the descriptive Bayesian fit therefore motivate a latentprocess model that can separate route choice from response noise.

Multinomial Processing Tree Modelling

Methods

- Ratings were thresholded at ≥ 4 to model accept vs. reject decisions.
- The Bayesian MPT separates three latent factors: attention, filler-derived yes-bias and structural route choice.
- For SA items, frequency is added directly to the latent base-generation parameter b on the logit scale; the model thus tests whether more frequent forms are more likely to receive a base-generation rather than an ellipsis parse.

Latent Structural Routes
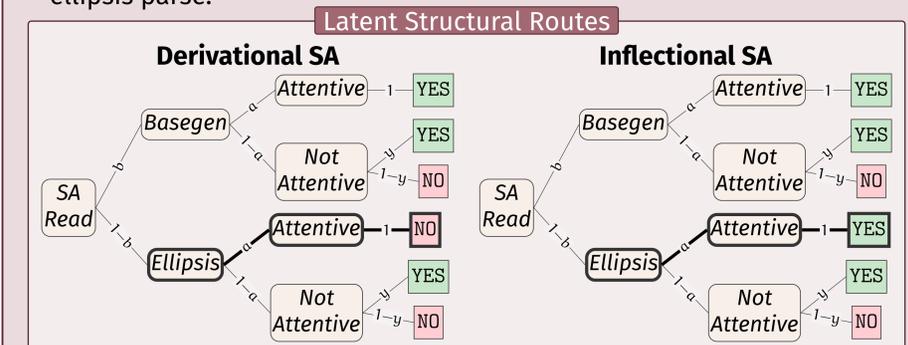
Bayesian Posterior Summaries

Suffix	Full P(acc)	SA P(acc)	Freq. β [89% CrI]	P(β > 0)
-maker	0.34 [0.24, 0.44]	0.19 [0.11, 0.29]	+0.15 [−0.16, +0.45]	0.80
-having	0.77 [0.69, 0.85]	0.65 [0.53, 0.76]	−0.20 [−0.49, +0.08]	0.11
-for	0.36 [0.26, 0.46]	0.32 [0.23, 0.42]	+0.06 [−0.33, +0.43]	0.61
-less	0.86 [0.79, 0.92]	0.49 [0.37, 0.62]	+0.08 [−0.06, +0.26]	0.83

Frequency effects are on the logit scale; posterior mass above zero is shown explicitly.

- The best binary MPT outperforms the binary brms model (ΔELPD $= 7.47$); mean attentiveness is 0.81 and inattentive yes-bias is 0.59.
- Frequency shifts base-generation in the predicted direction for *-maker* and *-less* (P(β>0) $= 0.80$ and 0.83). The effect with *-maker* is the key latent result that was absent in the binary brms model.
- Overall, frequency modulates structural route choice rather than being a uniform, undifferentiated acceptability parameter.

Summary & Future Work

- Frequency modulates derivational SA by increasing the availability of the base-generation parse.
- The frequency effect on the suffix *-maker* only emerges in the Bayesian MPT, while it remains weak in surface ordinal ratings.
- Future work should link suffix-specific frequency effects to independent diagnostics for attachment height and ellipsis compatibility.
- Future work should examine frequency effects via scope interpretations: While base generation should favor joint readings of coordinations, ellipsis should favor independent readings of suffixes on each conjunct.

Akkuş, Faruk. 2016. Suspended affixation with derivational suffixes and lexical integrity. **Kabak**, Barış. 2007. Turkish suspended affixation. **Kornfilt**, Jaklin. 2012. Revisiting "suspended affixation" and other coordinate mysteries. **Morgan**, Emily, and Roger **Levy**. 2015. Modeling idiosyncratic preferences: How generative knowledge and expression frequency jointly determine language structure. **Morgan**, Emily, and Roger **Levy**. 2016. Abstract knowledge versus direct experience in processing of binomial expressions.