

Learning biases in the relative order of person and number markers

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Background Patterns of morpheme linear order are often assumed to reflect syntactico-semantic composition [3]. Morphemes that compose with the stem earlier on in derivation appear linearly closer to it. A classical example of this is the relative order of derivational and inflectional affixes with respect to the stem: derivational affixes tend to appear closer to the stem than inflection affixes (e.g. ‘marri-age-s’ [3, 2]). Indeed, a bias towards compositional transparency in linearization has been attested in typology (e.g., Greenberg’s Universals 20 and 39, [4]) and, more recently, in behavioural studies, where these patterns have been shown to be preferred by learners [8].

Here we are interested in the relative ordering of person and number markers. In this domain, it is typically assumed that number dominates person [5]; that is, person features compose with the stem before number features do. If linearization directly reflects the compositional process, one would expect a tendency for person morphology to appear closer to the verbal or pronominal stem than number (henceforth, ‘person-closer’ pattern in 1a). Surprisingly, typological data suggests a tendency for person to precede number linearly (‘person-left’ in 1b) across verbs and pronouns in head-initial (e.g., Huave or Didinga) and head-final languages (e.g., Lenakel or Mohawk) [6, 9]. Even though there is a rather small sample of languages with a boundary between person and number morphemes, the ‘person-left’ pattern is the most frequent across prefixal (8/9), suffixal (17/22) and discontinuous agreement (25/25). Most accounts of this person-number linearization have proposed ordering constraints for these specific agreement affixes [9, 5].

To date, however, there is no independent evidence beyond the typology for the claim that person-left is preferred by the human linguistic system. Moreover, only nine languages have been reported to have distinct person and number prefixes. In this case, a somewhat surprising typological finding, backed only by sparse numbers requires converging quantitative evidence [7]. We use a now well-established method, artificial language learning, to assess whether there is a behavioral preference for one of the two linearization strategies [1, 8]. If a person-left strategy is indeed preferred, then theorists are justified in positing specialized linearization constraints for this domain. If person-close is preferred, this would suggest that the general tendency for linear order to reflect composition is at play in this domain as well.

Experimental design Participants were taught a miniature language with three verbal stems. Singular and 1st person agreement were unmarked. Plural number and 2nd person were each expressed with an affix. This taught language could be HEAD-FINAL (person/number prefixes) or HEAD-

(1)	HEAD-FINAL	HEAD-INITIAL
a. Person-closer	N-P-stem	stem-P-N
b. Person-left	P-N-stem	stem-P-N



Figure 1: Trial in HEAD-FINAL condition (2SG).

INITIAL (person/number suffixes), depending on the assigned condition.

In the experimental setup, participants were presented with a family playing a question-answer game. The questions were in English but the answers involved verbs in the new language (see Fig.1). Person and number meanings were expressed by highlighting subsets of family-members. Participants were trained on 1SG, 1PL, and 2SG, but not on 2PL—which would require two overt affixes. Thus they learned that affixes either preceded (HEAD-FINAL) or followed (HEAD-INITIAL) the verbal stem. However, they were provided with no evidence about the relative order of the two affixes. At test, the held out 2PL meaning

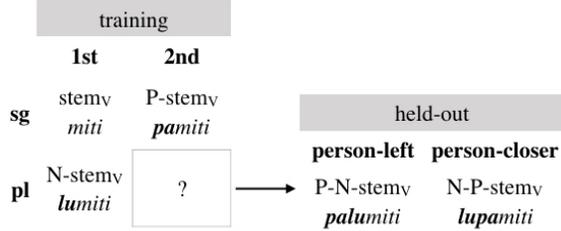


Figure 2: Design in HEAD-FINAL condition.

was added and participants had to select one of two options to obtain a 2PL form (see Fig.2). In the head-initial condition, both person-close and person-left predict stem-P-N (rather than stem-N-P). Crucially, in the head-final condition the predictions differ: person-close predicts N-P-stem, but person-left predicts P-N-stem.

Results 100 English speakers were randomly assigned to one of two conditions (HEAD-FINAL: 46; HEAD-INITIAL: 54). The frequency with which participants selected person-closer responses (i.e., stem-P-N or N-P-stem) is shown in Fig.3. A logit mixed-effects model revealed that (i) the proportion of person-closer responses in held-out trials was significantly above chance (intercept: $p < .001$); and that (ii) the effect of condition was not significant ($p = .12$), indicating that a preference for person-closer patterns holds regardless of whether the morphemes were prefixes and suffixes.

Discussion Our findings suggest that the apparent cross-linguistic tendency for person to linearly precede number does not correlate with a learning preference.

Rather, learners in our experiment inferred that held-out morpheme combinations should place person closer to the stem than number, regardless of whether morphemes were prefixes (HEAD-FINAL) or suffixes (HEAD-INITIAL). This is in line with the hypothesized compositional structure in which number dominates person (e.g., [5]), but further suggests that the person-left typological tendency does not stem from a general cognitive constraint on person-number morpheme order. Instead, as in a number of other domains, linearizations that reflect syntactico-semantic composition are preferred during learning [1, 8]. While this finding conflicts with the previously documented ‘person-left’ tendency in typology, the sparse numbers in this case point to the possibility that this is purely accidental. We have argued that in such cases, evidence from behavioral experiments is

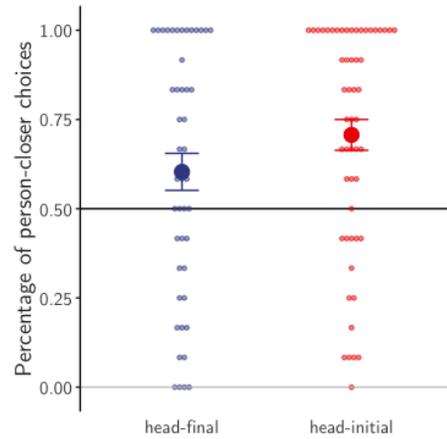


Figure 3: Results.

key to providing justification for strong theoretical claims.

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