

## **Semantics-based spontaneous compounding emergence in artificial sign languages**

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Compounding is one of the simplest and most widespread word-formation processes in human languages: new words are created by combining existing ones in a simple hierarchical structure involving a head and a modifier. Some researchers claim compounding to be one of the earliest linguistic processes to emerge in language evolution (Jackendoff 1999, 2002; Heine and Kuteva 2008), but it remains available in older established languages as well. In spoken languages, compounding is nearly universal (Bauer 2017), and so far, has also been attested in all signed languages where word-formation processes have been investigated (Meir, Aronoff, Sandler and Padden 2010; Tkachman and Meir 2018).

Here, we report on the use of compounding as a word formation strategy in a sign creation study. In the study, 50 native speakers of English with no knowledge of any sign language, ages 19-72, were asked to create sign names for 100 objects, appropriate to be used in an artificial sign language. The stimuli consisted of pictures presented to the participants one-by-one on a computer screen in a random order. We were primarily interested in the influence of various kinds of iconicity in signs, but during coding, we noted that sometimes participants reused already created signs in what appeared to be compound names for objects that were semantically or conceptually related to the earlier meaning. For example, a few participants reused the sign they coined for CAT much later in a compound sign for LION (see Fig. 1). Based on this observation, we decided to analyze the data for compounds in a more systematic way. We classified as potential compounds all instances of multi-sign responses that were used as a label for an object, and that did not include poses, hesitations, body shifts, etc. This comprised 2385 responses (out of the total 4975 responses). We excluded all compounds where one of the signs indicated only size or shape, as these sign combinations appear closer to classifier constructions (common in sign languages) than true compounds. (We are analyzing those responses separately.) Additionally, we excluded all compounds where all the signs were unique, that is, we only included compounds where at least one of the signs used have been coined for an earlier referent. Note that the reused sign did not have to be part of a multi-sign response;

it could have been introduced in a one-sign response (though we did not count single signs as part of the compound family). This left 1042 responses which were grouped into *sign families* based on the reused sign: compound responses that included the same sign were considered a sign family. Data were coded by two independent coders.

Results: All 50 participants created at least some multi-sign responses, and 44 out of 50 reused signs in compounds. Overall, we identified 266 sign families (mean=5.54 per participant in those who created them). Of the 2385 multi-sign responses, 1042 were members of a sign family (23.7 responses per participant in those who created them, out of 100 total responses per person). Semantically, sign families could be classified as belonging to one of 35 categories, with the majority belonging to vehicles (30 sign families), water-related entities (25), trees (23), hard/solid entities (21), and animals (19). We speculate that these particular categories all have a *prototypical member* which can be easily used as part of a compound for other members of the category. This is especially interesting, since the order of presentation of pictures for sign creation was random; that is, we did not manipulate the data to have more prototypical members to appear before less prototypical members. Another possibility is that the participants reused signs due to *expanding meaning space*: since they did not know which referents they needed to name in the future, or how many, it encouraged them to re-use signs they already created, and to do so in a more systematic manner (see Nölle et al. 2018; Raviv et al. 2019). These findings suggest that some systematicity can emerge without iterative communication, generational transmission, or new learners (cf. Kirby et al. 2015; Raviv et al. 2019).

The coding and analysis of headedness in this dataset is ongoing.

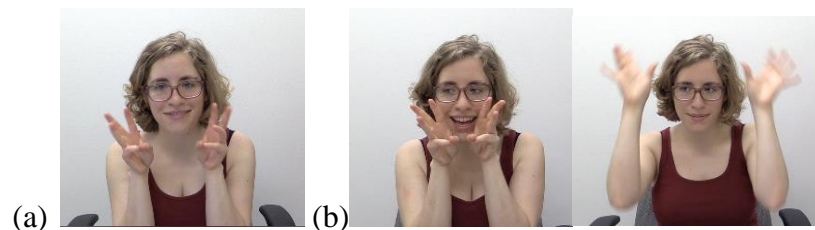


Figure 1. (a) CAT represented with ‘whiskers’, (b) LION represented with the form for ‘whiskers’ previously coined for CAT and another sign for ‘mane’. Note that this participant was thinking aloud as she was inventing her signs, and explicitly named signs in (b) as ‘cat’ and ‘mane’.

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