

Interpreting emerging structures: The interdependence of combinatoriality and compositionality

Hannah Little* and Catriona Silvey†

*Vrije Universiteit Brussel

†University of Edinburgh

Languages have structure on two levels: the level of combinatoriality, where meaningless building blocks make up meaningful signals, and the level of compositionality, where a combination of meaningful signals conveys a meaning which is a transparent function of the meanings of the signals and the way they are combined. Experimental work on language evolution has demonstrated the emergence of structure from unstructured input; however, this is often treated without detailed analysis of structure in relation to meaning. As such, the terms “compositionality” and “combinatoriality” are often conflated or used interchangeably. We argue that even when compositionality and combinatoriality are clearly defined, their emergence and development are interdependent. Further, this interdependence can be investigated experimentally to yield insights into the conditions that facilitate the two forms of structure.

Defining combinatoriality as the reuse of elements in a pattern that does not predict meaning, and compositionality as the reuse of elements in a pattern that does predict meaning, allows for precise characterisation of structure in both real language and experimental results. However, we still encounter problems defining transitional states. In some experimental work investigating the emergence of combinatoriality from a continuous articulation space (de Boer & Verhoef, 2012; Verhoef 2013) participants represent some meanings iconically. As a communication system emerges, initially iconic signals may be reinterpreted as combinatorial, making previously meaningful elements meaningless; however, disentangling these from the point of view of the participant can be challenging (Roberts & Galantucci, 2012). Conversely, Kirby, Cornish & Smith (2008) show compositional language arising through cultural transmission from initially meaningless syllables within holistic signals. The transition of this structure from combinatorial to compositional is driven by participants reinterpreting meaningless signal elements as predicting meaning.

Importantly, these are not only methodological issues with specific experiments, but apply to real language, where combinatorial and compositional structures are neither autonomous, nor fully stable. Pressures from meaning affect combinatorial inventories across languages: e.g., Wedel, Jackson & Kaplan (2013) show that the loss of phonemic contrasts is predicted by the number of minimal

pairs they distinguish. On a more local level, particular constructions within a language move from being compositional to combinatorial as previously novel compounds are lexicalised (e.g. ‘understand’, ‘cupboard’). These changes are driven by the cumulative effects of individuals’ changing conceptions of how elements of language predict meaning. We propose future work examining the pressures that lead individuals to introduce and reinterpret language structure in relation to meaning.

- de Boer, B., & Verhoef, T. (2012). Language dynamics in structured form and meaning spaces. *Advances in Complex Systems*, 15(03n04).
- Kirby, S., Cornish, H., & Smith, K. (2008). Cumulative cultural evolution in the laboratory: An experimental approach to the origins of structure in human language. *Proceedings of the National Academy of Sciences*, 105(31), 10681-10686.
- Roberts, G., & Galantucci, B. (2012). The emergence of duality of patterning: Insights from the laboratory. *Language and Cognition*, 4(4), 297-318.
- Verhoef, T. (2013). *Efficient coding in speech sounds: Cultural evolution and the emergence of structure in artificial languages*. Ph.D. Thesis. The University of Amsterdam.
- Wedel, A., Jackson, S., & Kaplan, A. (2013). Functional load and the lexicon: Evidence that syntactic category and frequency relationships in minimal lemma pairs predict the loss of phoneme contrasts in language change. *Lang Speech* 56(3), 395-417.