From Holophrases to Abstract Grammatical Constructions in Development and Evolution

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Previous research (Dominey 2000a,b; 2002) presented a sentence-to-meaning mapping model which learned abstract grammatical constructions that could systematically generalize to novel sentences. The model failed however to account for the transition from agrammatical holophrases to these abstract grammatical constructions. The current research addresses this transition issue in the context of development (Tomasello 2003), and evolution (Wray 2000) within the framework of a construction-based model of language acquisition.

Construction Model: The model is based on the principles that (1) grammatical constructions are mappings between sentence structure and semantic structure, and (2) that grammatical constructions can be identified, for storage and retrieval, by the pattern of closed and open class words unique to each construction type.

Abstract Constructions: In the abstract construction framework, constructions are identified by the *identity* and relative position of closed class elements, and by the *lexical category* and relative position of open class elements. Thus, for example, two distinct transitive sentences made up of different open class elements will correspond to the same grammatical construction and the same form to meaning mapping. This allows the model to generalize in a systematic manner to new sentences based on learned grammatical construction types (Dominey 2000a,b; 2002).

Holistic Constructions: However, developmental (Tomasello 2003) and evolutionary research (Wray 2000) indicate that the use of abstract constructions is preceded by a stage in which utterances are treated as distinct holophrases. In this phase, each holophrase utterance should correspond to a distinct construction. This reflects the case where the functional category of open class elements (e.g. names) that can be instantiated as variables or slots within abstract constructions has not yet been formed. Thus in the model, constructions are identified by the identity and position of all open and closed class elements (i.e. the entire utterance), so that each sentence is represented as a holistic and distinct construction, with the resulting limitations on expressiveness and generalization.

Transition from Holophrase to Abstract Construction: When the lexical category of concrete objects or nouns begins to emerge, these idiom-like holophrases begin to be replaced by partially generalizable "pivot" schemas like "Gimme ____" where the "___" corresponds to an object name variable (Tomasello 2003). In the model constructions, these nouns become represented by their lexical category, rather than by their identity. Verbs remain undifferentiated and are thus bound to distinct constructions. This leads to an item-based "verb island" phase (Tomasello 2003). The subsequent generalization on verbs allows for the full abstract construction capability. Simulations demonstrate that the progressive emergence of lexical categories will be correlated with the emergence of progressively more abstract constructions that generalize over those categories. This is consistent with the evolutionary analysis proposed by Wray (2000), in which during an extended period of holistic language use, cognitive abilities develop so that the emergence of naming allows the development of argument structure and the progressive segmentation of holistic utterances.

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