

ICONIC VERSUS ARBITRARY MAPPINGS AND THE CULTURAL TRANSMISSION OF LANGUAGE

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Most theories of language evolution assume that the ability to use symbols was a crucial step towards modern language (for a review see, e.g., Christiansen & Kirby, 2003). Following de Saussure, symbol use is typically construed as the capacity for establishing arbitrary mappings from sounds or gestures to specific concepts and/or percepts for the purpose of communication. Although intuition suggest that iconic relationships between form and meaning should make the learning of such mappings easier (e.g., sound symbolism), recent simulations by Gasser (2004) have demonstrated that, for large vocabularies, the learning advantage is for arbitrary relationships. Because systematic iconic mappings between forms and meanings require strong constraints on the space of possible pairings (e.g., a particular onset phoneme is restricted to only co-occur with a particular facet of meaning) it is only possible to encode efficiently a relatively small number of words. In contrast, arbitrary mappings between form and meaning impose fewer constraints and therefore permit the learning of a large and extendable vocabulary, which is the hallmark of human language^a.

However, the cost of arbitrariness is that generalities about the language structure, such as the lexical category of a word, are not readily learnable from the sounds of the language. Such systematicity has been seen as advantageous, perhaps even necessary, for learning categories (Braine, 1987). In this paper, we hypothesize that cultural transmission has shaped language so as to incorporate certain systematic properties of iconic mappings in order to facilitate the learning of lexical categories. Importantly, the iconic mapping is not between form and meaning but between *form* and *lexical category*.

^a Though some degree of iconicity may be useful in localized cases, such as expressives in Japanese and Tamil (Gasser, Sethuraman, & Hockema, 2005).

Table 1. Number of significant cues and successful classification for each language.

	Open/Closed		Noun/Verb	
	Cues	Classification	Cues	Classification
English	17	62.1%	7	61.4%
Dutch	14	61.4%	16	71.0%
French	16	62.4%	16	64.9%
Japanese	8	61.8%	17	74.5%

A crucial prediction from the form-category mapping hypothesis is that current languages ought to reveal systematic relations at the lexical category level even though they are absent in sound-meaning mappings. We tested this prediction by analyzing the 1000 most frequent words from large corpora of child-directed speech in English, Dutch, French, and Japanese. For each language, we assessed approximately 50 cues that measured phonological features across each word. Table 1 shows the number of cues that significantly distinguished function from content words and nouns from verbs in each language (corrected for multiple comparisons). Classifications using discriminant analysis tested that the cues were able to correctly identify the category of a significant proportion of the words (all $p < .001$).

The presence of significant effects across four distinct languages supported our hypothesis that form-category systematicity is a property of natural languages. Because the number of lexical categories in any language is minimal and restricted, the strict constraints imposed on form-meaning mappings do not apply. Consequently, cultural transmission is likely to have favored languages that incorporate such form-category systematicity as it facilitates initial learning of grammatical structure without sacrificing vocabulary size. Thus, as indicated by our analyses, current languages may have evolved to incorporate an optimal compromise between arbitrary and iconic mappings in language learning.

References

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