

Sound Advice in Language Comprehension: The Influence of Phonological Typicality on On-line Sentence Processing

Thomas A. Farmer¹, Morten H. Christiansen¹, and Padraic Monaghan²
¹Cornell University, ²University of York

Some words have a phonological form that is more typical of its lexical category than others, and this may provide useful cues for language acquisition. We suggest that the phonological typicality of a word, relative to its lexical category, may influence both lexical category assignment and sentence processing in adulthood.

Focusing on nouns and verbs, we measured phonological typicality (PT) by transforming words into a slot-based phonological representation in which each syllable was encoded in terms of three slots for onset, two slots for nucleus, and three slots for the coda (e.g., /k . . e . l p . /, /h . . e . l p . / and /s t r i i t . /). Each phoneme was represented in terms of 11 phonemic features. We then computed the Euclidean distance between the resulting phonological representations and all other nouns and verbs. We found that nouns tend to be significantly closer to other nouns and verbs significantly closer to other verbs in terms of their phonology (Monaghan, Chater, & Christiansen, *under revision*).

- (1) The office secretary was instructed to **arrange** all of the files in alphabetical order.
- (2) The office secretary was instructed to **manage** the office while her boss was out of town.

Ten sentence frames were constructed with verbs ('was instructed') that strongly bias participants to expect infinitival complements. In one resolution, the infinitival complement was a verb with high verb typicality ("verby" verb, 'arrange' in 1), and the other resolution contained a verb low in verb typicality ("nouny" verb, 'manage' in 2). These target verbs were controlled for frequency, number of syllables/phonemes, number of nearest neighbors, orthographic length, as well as the overall sentence plausibility. Sentences were presented using a word-by-word self-paced reading task. Participants took significantly longer to read the "nouny" verb targets compared to the "verby" verb targets ($t(21)=3.145, p=.005$; $t(18)=1.77, p=.093$).

Given that verb PT affected on-line sentence processing on unambiguous verb-biased structures, Study 2 investigated the influence of phonological typicality on sentence processing in the context of syntactic ambiguities arising from the lexical category ambiguity associated with noun/verb homonyms. A set of sentences was created in which the phonological typicality of the homonyms was manipulated in such a way that 10 words were phonologically typical nouns and 10 were phonologically typical verbs. Half of the sentences for both nouns and verbs were resolved with a noun interpretation of the ambiguity and the other half with the verb interpretation. Consider the following example:

- (3) Chris and Ben are glad that the bird **perches** *seem easy* to install.
- (4) Chris and Ben are glad that the bird **perches** *easily* in the cage.

The N/V homonym, 'perches', is a phonologically typical noun. Accordingly, it was predicted that participants would consider the noun resolution (3) over the verb interpretation (4). In other words, they should be slower ("garden-pathed") when encountering a verb resolution compared to encountering a noun resolution. A 2 (typical V vs. typical N) X 2 (N-resolved vs. V-resolved) X 2 (point of ambiguity (N/V homonym) vs. disambiguation (two words following N/V homonym)) repeated measures ANOVA was conducted. Plausibility (both of overall sentence and noun compound), frequency of usage, and degree of typicality were all controlled for in such a way that no significant differences existed between nouny and verby homonyms. A significant three-way interaction ($F_1(1, 29) = 11.15, p = .002, F_2(1, 18) = 5.28, p = .034$), revealed that phonological typicality did influence the manner in which participants preferred to resolve the sentences. Specifically, for the "verby" N/V homonym sentences, RTs increased from the point of ambiguity to disambiguation for the noun-resolved sentences much more so than they did for the verb-resolved sentences. Additionally, for the "nouny" N/V homonym sentences, RTs increased much more from the point of ambiguity to disambiguation for the verb-resolved sentences than they did for the noun-resolved sentences.

The results demonstrate that the sound properties of individual words have direct and immediate ramifications for on-line sentence comprehension, even in the visual modality. This study provides support for constraint-based theories of sentence processing in which multiple cues are integrated on-line in order to facilitate comprehension. Our results lend support to the notion that human sentence processing is a dynamic and highly interactive process influenced not only by syntactic and semantic information, but also by phonological cues in the linguistic input.

References

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