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Does a focus on universals represent a new trend in word recognition? A Commentary on Frost's Universal Model of Reading

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Abstract

Comparisons across languages have long been a means to investigate universal properties of the cognitive system. Although differences between languages may be salient, it is the underlying similarities that have advanced our understanding of language processing. Frost is not unique in emphasizing that the interaction among linguistic codes reinforces the inadequacy of constructing a model of word recognition where orthographic processes operate in isolation.

By allowing for the interaction of orthographic with other types of linguistic structure, Frost becomes an advocate for a more universal and less Hebrew-centered theoretical approach. For those of us who have long held that view, we welcome this change. In the past, Frost and his colleagues frequently offered up Hebrew as the exceptional language, citing its infixing rather than concatenation of morphemes as the reason why a model based on the principles that apply to English will not work (Frost, Deutsch, Gilboa, Tannenbaum, & Marslen-Wilson, 2000; Frost, Forster, & Deutsch, 1997; Frost, Katz & Bentin, 1987; Frost, Kugler, Deutsch, & Forster, 2005). It is they who characterized Hebrew as special and defined English as the default against which to evaluate other languages.

Variation among languages in reading and visual word recognition has long provided a tool with which to investigate universal properties of the cognitive system. Although differences between languages may be striking, it is the more abstract similarities, often captured in terms of complex interactions among linguistic codes (e.g., orthography × morphology) that have been more useful in advancing our understanding of the processes that underlie reading and word recognition. We highlight two well-established lines of research to make this point. Both capture the interaction of semantic with orthographic processing.

A common assumption in models of word recognition is that morphologically structured words are decomposed into their morphemes and that the initial process is semantically blind and based solely on the orthographic form of the stem (e.g., Forster & Taft, 1975; Rastle, Davis & New, 2004). Accordingly, analysis of a word composed of multiple

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morphemes (morphologically complex) proceeds without recourse to the meaning of its constituents or to the word as a whole. Counter to this claim, we have reported that semantically similar (e.g., coolant-COOL) prime-target pairs produce greater facilitation than do dissimilar (e.g., rampant-RAMP) pairs when English words appear in the forward masked primed lexical decision task (Feldman, O'Connor & Moscoso del Prado Martín, 2009). Likewise in Serbian, with its many words formed from an orthographically (and phonologically) identical stem, semantically similar primes produce greater facilitation than do semantically dissimilar primes (Feldman, Kostić, Gvozdenović, O'Connor, & Moscoso del Prado Martín, 2011). Results in morphologically rich Serbian, like those in relatively impoverished English, show very early effects of semantics under conditions that are purported to foster orthographic processing of a morpheme. In this respect, both studies confirm statistically a pattern that is revealed meta-analytically even when it is not uniformly significant in individual studies (Feldman et al., 2009). Note that English and Serbian are at opposite ends of the continuum with respect to systematicity in the mapping between form and meaning (with morphologically rich Serbian showing greater systematicity than English). Yet despite differences in their morphological complexity, both languages reveal contributions of semantics under conditions where others have asserted that orthographic processing dominates (see Rueckl & Aicher, 2008 for a review).

The second and more established line of research shows morphological influences on orthographic processing in both English and Hebrew (Feldman, Frost, & Pnini, 1995), minimal consequences of orthographic disruptions to the root morpheme introduced by Hebrew's infixing structure (Feldman & Bentin, 1994) and robust effects of morphological family size despite the contrast between Hebrew's infixing morphology and the concatenative morphology in English (Martın, Deutsch, Frost, Schreuder, De Jong, & Baayen, 2005). Data derive from varied tasks. In the segment-shifting variant of a naming task, participants decompose a word into its morpheme constituents, shift a letter sequence (ER in the example below) from prime to target, and then name the target aloud. Latencies were faster (15 ms) to form PAINTER from PAINT after seeing DRUMMER than after SUMMER. The critical manipulation is that ER on the former but not the latter is morphemic and thus changes the stem in a semantically predictable way. Analogous effects were reported in Hebrew (Feldman, Frost & Pnini, 1995) and Serbian (Feldman & Andjelković, 1992). A specifically Hebrew finding is that orthographic disruptions to a Hebrew prime (e.g., GMR) introduced by a word pattern that disrupts the root (GOMaR vs. GaMaR, where upper case letters are represented by letters and lower case letters by optional diacritics) did not alter facilitation to a morphologically related target in the lexical decision task (Feldman & Bentin, 1994). The failure to detect orthographic effects in Hebrew led Frost and his colleagues to claim that morphological roots provide the organizing principle for the lexical space of Hebrew while constituent letters and their position function to organize the space for English and other Indo-European languages (Frost et al., 2005; p. 1295). The results above fail to provide compelling evidence that the lexicons of Hebrew speakers are organized in a fundamentally different manner, however.

Family size (that is, the number of words sharing a base morpheme) predicts decision latencies in languages such as Dutch, Finnish, German and English, where base morphemes can stand alone as words or be affixed, but also in Hebrew where a second morpheme is infixed inside the root morpheme. Compounds constitute proportionally more morphological family members in English or Dutch than in Hebrew, but the languages do not differ in morphological family size (Martín, et al., 2005). Despite some variation in the manner by which morphemes combine, Hebrew, like the other languages, shows robust effects of morphological family size on single word recognition.

It is evident that the consequences of orthographic differences across languages can get exaggerated when orthographic structure is examined in isolation. The results of many studies that have been conducted over the past decade in languages other than English challenge the claim that orthographic processing remains isolated from phonological, morphological and semantic effects. Frost is not unique in claiming that serious consideration of the interaction among linguistic codes across languages reinforces the inadequacy of constructing a model of word recognition in English, or in Hebrew or Chinese for that matter, around isolated orthographic processes.

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