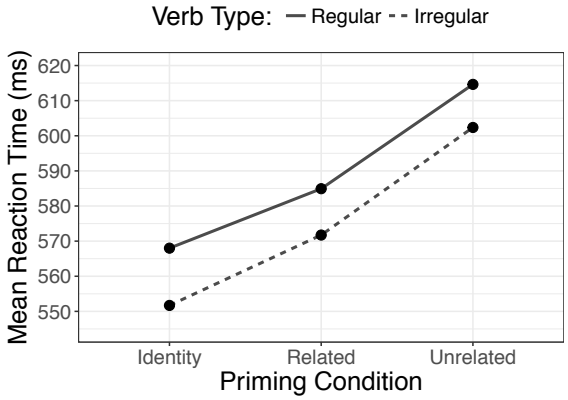
Form priming by discontinuous consonant letter strings in visual masked priming

Introduction: We report a visual masked priming study that tests whether English verbs are primed by their consonant graphemes in isolation (e.g. whether *grw* primes GROW) and whether this differs for regular verbs vs. irregular verbs (e.g. *walk*/*ed* vs. *grow*/*grew*). We hypothesized that constituent consonant strings would elicit priming based on similar findings in Semitic (though such strings may constitute morphemes in such languages) (e.g. Frost et al. 1997, Velan and Frost 2009), and on previous work showing a consonant advantage in spoken word recognition. For example, listeners can learn word boundaries defined by transitional probabilities between consonants only but not vowels only (Bonatti et al. 2005) and when asked to reconstruct a real word from a non-word by changing one segment, speakers prefer to preserve consonants (turning *kebra* into *cobra* rather than *zebra*) (Cutler et al. 2000). This indicates that consonantal structure is more tightly coupled with word identity than vowel structure. We ask if this extends to the visual modality and if vocalic inconsistency across inflected forms of irregular verbs plays a role.

Methods: 48 native monolingual English speakers (M_{age} = 21.5 yrs, 12 men) participated. Participants judged the lexicality of 60 English verbs (30 regular, 30 irregular) and 60 non-words. Targets were 3-6 letters long with 2-4 consonant graphemes. Real-word targets occurred in 3 priming conditions: **repetition** (*grow* primed GROW), **related** (*grw* primed GROW), and **unrelated** (*ctd* primed GROW).



Results: Response times (RTs) were analyzed by fitting a Linear Mixed Effects model in R (R Core Team 2015) using the lme4 package (Bates et al. 2015) and using the lmerTest package to simulate Satterthwaite approximations for degrees of freedom (Kuznetsova et al. 2016). Fixed effects included priming condition (repetition, related, control; ref. level: control), verb type (irregular, regular; ref. level: regular), frequency (SUBTLEX-US log contextual diversity; Brysbaert and New 2009), number of lexical neighbors, and the interaction of priming condition by verb type. The effects of priming in the repetition and related conditions were significant ($t(3503) = -7.4$, $p < 0.001$ and $t(3504) = -4.0$, $p < 0.001$, respectively): participants responded faster to real words in the repetition and related conditions than in the control condition. Verb type and the priming condition by verb type interactions were not significant ($p > 0.05$).

Discussion: English verbs are primed by their constituent consonant letters, indicating that the auditory consonant advantage in word recognition extends to the visual modality, though no evidence was found that it is stronger for irregular verbs. This result has implications for models of phonological encoding in visual word recognition, such as whether phonological encoding of orthographic words occurs sequentially or in parallel and at the segment or syllable level. Most work on this issue has tested prime-target pairs exhibiting total phonological overlap, making it difficult to diagnose either the unit (phoneme or syllable) or the method (parallel or sequential) of encoding. Carreiras et al. (2005) tested partially overlapping prime-target pairs and found priming when overlap was in the first phonological syllable. The present study shows that even non-syllabic, non-contiguous overlap between prime and target allows for priming, possibly indicating that phonological encoding occurs in parallel and at the segment level.

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