Consonants, vowels, and lexical representations: evidence from auditory lexical decision

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The present study investigates the nature of lexical representations in auditory spoken word recognition by native, early-bilingual, and late-bilingual speakers of English. Specifically, we investigate how the proportion of consonants and vowels in English words influences lexical processing in both native and non-native speakers. We investigated this question by analyzing data from the Massive Auditory Lexical Decision project (MALD; Tucker et al., 2019). This extends a line of research which has generally employed a single experimental paradigm.

In a number of languages, consonants have been found to be more strongly related to lexical representations than vowels (Cutler et al., 2000; Nespor et al., 2003; Nazzi & Cutler, 2019). This is probed by having participants change one segment in a nonce word to create an existing word, following Van Ooijen (1996). For example, if given the nonce word *shevel* [ʃɛvəɫ], native English speakers generally elect to change a vowel to form the word *shovel* [ʃʌvəɫ] rather than changing a consonant to form the word *level* [lɛvəɫ]. When asked to change consonants, English speakers do so more slowly, and make more errors. This finding has been replicated for a number of languages, including Dutch, Spanish, Japanese, and American English (Cutler et al., 2000; Marks et al., 2002; Cutler & Otake, 2002; Moates et al., 2002). New et al. (2008) proposed that this finding would not hold for languages with lexical tone. Experimental findings from Mandarin by Wiener & Turnbull (2016) provide support for the New et al. (2008) hypothesis.

Our research questions are as follows: 1) Does the proportion of vowels (PropV) in words affect the time taken to recognize English words in an auditory lexical decision task?, and 2) Does the presence or direction of this effect differ between native English speakers and Mandarin-English bilingual speakers with different language backgrounds? To investigate how PropV influences lexical processing, we fit a series of linear mixed-effect models predicting reaction times from L1 English and Mandarin-English bilingual speakers from the MALD data. We added our predictors of interest: PropV and language background (monolingual, simultaneous bilingual, early sequential, late sequential) to a baseline model with variables known to impact spoken word recognition (word duration, word frequency, neighbourhood density, phonological uniqueness point, trial number, and word run length, in addition to random intercepts accounting for pseudoreplication and a random slope for PropV by participant).

Results indicate that PropV significantly improves model fit ($\chi^2(1) = 9.53$, $p = 0.002$), with words containing more vowels being responded to more slowly. There was also a main effect of language background ($\chi^2(3) = 111.18$, $p < 2.2e-16$), with monolinguals and simultaneous bilinguals responding faster than both early and late sequential bilinguals. The effect of PropV does not differ based on the language background, as evidenced by a lack of a significant interaction ($\chi^2(3) = 1.18$, $p = 0.758$).

These results are in line with previous experimental findings, all of which have employed a meta-linguistic task of segment substitution. The present study, however, presents evidence from an implicit task. First, the effect of PropV is in line with the hypothesis that consonants are more closely tied to lexical representations in English, as words with a higher ratio of vowels to consonants are responded to more slowly. Second, the lack of a significant interaction between participants' language background is in line with the findings of Wiener (2020), who found that non-native speakers follow language-specific biases in segment substitution studies, even at intermediate levels of second-language proficiency. These results will be discussed with respect to bilingual lexical processing and lexical representations.

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