Lexical decision tasks using auditory repetition and cross-modal priming have been used to investigate the extent to which linguistic and social sources of variation in the speech signal are encoded in cognitive lexical representations. For example, both variants of English words with an alternation between a word-medial flap and an alveolar stop prime target words with either variant when presented among trials with English-like nonword targets. However, when presented among trials with less English-like nonword targets, allophonically mismatching variants do not prime each other (McLennan et al., 2003). Similarly, words with both a “canonical” allophonic variant (i.e., [nt]) and a reduced variant with a nasal flap prime matching visual targets. However, a priming advantage is observed for the canonical form, especially for target words that are less frequently produced with the reduced variant (Ranbom & Connine, 2007). These results suggest that multiple variants are encoded in lexical representations, but that some variant representations are more robust than others.

The representation of variation due to social factors has also been examined using the priming paradigm. Stylistically-appropriate variants (i.e., alveolar stops in a careful style or flaps in a casual style) exhibit comparable semantic priming, but no semantic priming is observed for stylistically-inappropriate flap variants in a careful style (Sumner, 2013). A similar asymmetry has been found for a merger-in-progress in New Zealand English. Whereas the merged variant primes targets related to both vowel categories involved in the merger, the older unmerged variant only primes targets related to itself (Rae & Warren, 2002). Asymmetries in form priming have also been observed for two mergers in Southern French. Whereas listeners with a socially unmarked merger exhibit priming for prime-target pairs containing both matching and mismatching vowels, listeners with a socially-marked merger exhibit priming for matching prime-target pairs only (Dufour et al., 2007). Relatedly, dialect familiarity has been shown to affect lexical priming. Both local and standard variants exhibit form and semantic priming for local listeners, but priming effects are reduced for non-local listeners (Sumner & Samuel, 2009). These results provide further evidence that multiple variants are encoded in lexical representations, and that these variants can be linked to social information about style, age, or regional dialect.

This previous research focused on the lexical representation of cross-category allophonic and social variants. The goal of the current study was to explore the role of subphonemic vowel variation, due to phonetic reduction and social variation, in lexical representation. Eighty-two monolingual American English listeners were presented with a cross-modal lexical decision task. The auditory primes were real words extracted from recorded read-speech passages produced in clear and plain lab styles by male and female talkers from the Midland and Northern American English dialect regions. The auditory primes were balanced for talker gender, talker dialect, and speaking style, as well as lexical frequency and phonological neighborhood density, two factors that are known to contribute to phonetic reduction. The experimental trials included both matching prime-target real word pairs and phonologically and semantically unrelated real word pairs. Filler trials were presented with real word primes and nonword targets. Targets were paired with different primes in a counterbalanced design across listeners.

Response times for correct experimental trials were analyzed using a linear mixed-effects model with fixed effects for trial type (matching or unrelated), and speech style, talker gender, talker dialect, word frequency, and neighborhood density of the auditory prime, plus all two-, three-, and four-way interactions. The results revealed faster response times for matching trials than unrelated trials, confirming an overall priming effect. Responses were also faster following Midland primes than Northern primes, although the trial type x talker dialect interaction was not significant, suggesting that the subphonemic dialect variation in the primes did not impact the magnitude of priming. Two significant four-way interactions were also observed. The trial type x speech style x talker gender x lexical frequency interaction (Figure 1, left panels) shows that the priming advantage for matching trials is largest for high-frequency primes produced by male talkers in plain speech. The trial type x speech style x talker gender x neighborhood density interaction (Figure 1, right panels) shows that the priming effect is largest for high-density primes produced by male talkers in plain
speech. These effects were independent of a significant covariate of prime vowel duration: longer primes led to faster response times than shorter primes.

![Figure 1](image_url)

**Figure 1.** Effects of prime lexical frequency (left panels), neighborhood density (right panels), speech style, and talker gender on response times to matching vs. unrelated targets.

The largest priming effects were observed for high-frequency and high-density primes produced by male talkers in plain speech. Figure 1 illustrates that this effect is due primarily to slower responses following these types of primes in unrelated trials, rather than faster responses following these types of primes in matching trials. In particular, although high-frequency primes facilitate responses for matching trials, this effect of frequency is comparable across talker gender and speech style, whereas the effects of frequency and density on responses for unrelated trials vary with talker gender and speech style. Previous research with these materials showed that male primes and Northern primes are less intelligible than female primes and Midland primes and that high-frequency and plain style primes are more phonetically reduced than low-frequency and clear style primes. Thus, when primes are less intelligible, more reduced, and/or have more lexical competitors, lexical decisions to unrelated visual targets are slowed, suggesting that processing more difficult auditory primes interferes with immediate, subsequent processing of an unrelated visual target. This processing cost reflects sustained lexical competition due to a mismatch between a difficult prime and the relevant lexical representations (Broersma, 2012). Thus, less familiar subphonemic dialect variants are less robustly encoded than more familiar dialect variants, consistent with previous work on cross-category dialect variants (e.g., Sumner & Samuel, 2009). Similarly, highly phonetically reduced tokens extracted from running speech are not robustly encoded in listeners’ lexical representations of isolated words, comparable to Sumner’s (2013) results for stylistically-appropriate vs. inappropriate variants. Instead, reduced forms may be encoded in representations that are more relevant to running speech. We therefore expect that the magnitude of the priming effect (matching vs. unrelated) for these difficult forms would diminish if the primes were presented in their natural phrasal context.

References