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Research Article

Variation in the strength of lexical encoding across dialects

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ABSTRACT

Lexical processing is slower and less accurate for unfamiliar dialects than familiar dialects. The goal of the current study was to test the hypothesis that dialect differences in lexical processing reflect differences in lexical encoding strength across dialects. Lexical encoding (i.e., updating the cognitive lexical representation to reflect the current token) was distinguished from lexical recognition (i.e., mapping the incoming acoustic signal to the target lexical category) in a series of lexical processing tasks with Midland and Northern American English. The experiments were conducted in the Midland region with Midland and Northern listeners. The results confirmed differential processing of the two dialects: the Midland dialect was processed more quickly than the Northern dialect. The results further revealed significantly larger repetition benefits (i.e., priming) and cross-dialect lexical interference effects for lexical forms in the Midland dialect than in the Northern dialect for both listener groups, particularly when the stimulus materials were presented in noise. These results suggest that lexical information is more strongly encoded for the contextually-local Midland dialect than for the non-local Northern dialect. We interpret these effects as reflecting cognitive processing costs associated with normalization for dialect variation, which lead to weaker lexical encoding under more difficult processing conditions.

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1. Introduction

1.1. Lexical recognition and encoding

Lexical processing involves mapping the incoming acoustic signal to the target lexical category (i.e., recognition) and updating the cognitive lexical representation to reflect the current token (i.e., encoding; Norris, McQueen, & Cutler, 2003). In an exemplar approach, lexical representations are groups of individual tokens that have been previously recognized and encoded (Goldinger, 1998; Johnson, 1997; Pierrehumbert, 2001). For example, the representation of the word *bad* is the group of tokens that have been previously recognized and stored as exemplars of the category *bad*. The recognition process involves identifying the category to which the current token is most similar and the encoding process involves adding the current token to the existing representation for the target word (Goldinger, 1998; Johnson, 1997; Pierrehumbert, 2001). Lexical representations vary in their robustness as a function of the number and strength of the exemplars comprising them (Johnson, 1997; Pierrehumbert 2002, 2006). For example, frequent words have more robust representations than less frequent words because frequent words have more exemplars comprising their representations. Similarly, recently encountered words have more robust representations than less recently encountered words because recently encountered words have stronger (i.e., less-decayed) exemplars comprising their representations. Robust representations facilitate the word recognition process, leading to more accurate recognition for more frequent (Broadbent, 1967; Howes, 1957) and more recently encountered (Goldinger, 1996) words.

Lexical recognition and encoding are partially independent processes. Although a failure to recognize a target word also leads to a failure to encode the exemplar in memory, recognition does not necessarily lead to encoding. For example, a listener may fail to encode an exemplar when the target word is correctly recognized, but a mispronunciation is detected (Garrett & Johnson, 2012). Lexical encoding can also vary in strength, so that even recent exemplars may contribute different weights to the overall

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representation. For example, “typical” variants are encoded more robustly than “atypical” variants (Nygaard, Burt, & Queen, 2000), and even atypical variants can be robustly encoded when they are “idealized” or socially salient (Sumner, Kim, King, & McGowan, 2014). Thus, variants associated with socially salient dialects are predicted to be more robustly encoded than variants associated with less salient dialects (Sumner et al., 2014). The goal of the current study was to explicitly test this prediction about differences in the strength of lexical encoding across dialects as a function of the listeners' experience with regional dialect variation.

1.2. Lexical processing across dialects

Lexical processing is faster and more accurate for native and standard dialects than for unfamiliar, non-standard dialects (Clopper, Pierrehumbert, & Tamati, 2010; Floccia, Goslin, Girard, & Konopczynski, 2006; Impe, Geeraerts, & Speelman, 2008; Labov & Ash, 1997; Sumner & Samuel, 2009). This processing benefit for familiar dialects parallels the processing benefits observed for high-frequency words (Broadbent, 1967; Howes, 1957) and follows directly from the structure of exemplar-based lexical representations.[1] In particular, phonological variation is captured in this approach by linking individual exemplars to multiple different types of categories (Pierrehumbert, 2002). For example, an individual token of the word *bad* may be linked to the lexical category for *bad*, as well as to an individual talker category (e.g., the first author's husband) and to a dialect category (e.g., Northern American English).

For an individual listener, different dialects can be familiar in different ways. The native variety is robustly represented and therefore easy to process because it has been encountered very frequently, including in the listener's own speech. The contextually-relevant local variety is also robustly represented and easy to process because it has been encountered recently in interactions with local talkers. The relevant standard varieties are robustly represented and easy to process because they are socially salient (Sumner et al., 2014). Varieties that are less familiar and not socially salient are less robustly represented due to limited exposure to and weaker encoding of their variants and therefore exhibit a cost in lexical processing. We propose that this processing cost reflects the normalization process, which in an exemplar approach involves mapping an unfamiliar variant to the target lexical representation during recognition (Johnson, 1997). This processing cost then leads to less robust encoding of dialect-specific variants, even when recognition is successful (see also Bent and Holt (2013)).

Sumner and Samuel (2009) obtained some preliminary evidence that differences in encoding across dialects may be central to the observed processing costs associated with less-robustly represented dialects. The dialects under investigation were the non-rhotic New York City (NYC) variety and the rhotic General American variety. In a long-distance priming lexical decision task (their Experiment 3), the stimulus words in the first block served as primes for the targets in the second block. For the “overt NYC” listeners, who spoke the non-rhotic variety, a repetition benefit was observed for all prime-target pairs, consistent with robust encoding of both native and standard forms. For the “covert NYC” listeners, who spoke a rhotic variety but had substantial experience with the non-rhotic variety, a repetition benefit was observed for both rhotic and non-rhotic targets following only rhotic primes. This pattern is consistent with cross-dialect processing costs associated with encoding non-salient variants: despite substantial exposure, the non-rhotic primes were less robustly encoded than the native rhotic primes and therefore did not facilitate later recognition of the same lexical forms. The “General American” listeners, who had substantial exposure only to the rhotic variant, exhibited priming only for rhotic prime-target pairs, consistent with their overall high error rates for the non-rhotic targets (24% errors in some conditions), suggesting that they did not recognize (or, therefore, encode) many of the non-rhotic targets as real words.

In the current study, we further explored the interaction between talker and listener dialect in lexical encoding. Our study differs from Sumner and Samuel's (2009) study in two critical respects. First, we adopted a recognition memory paradigm with a word recognition task to allow us to explicitly distinguish between the recognition and encoding processes (see Section 1.3). Second, we examined cross-dialect word recognition for two varieties of American English that exhibit subphonemic vowel variation, rather than categorically distinct variants, to ensure that an equally-high proportion of the target words were correctly identified by all listeners, allowing for an examination of encoding following successful recognition.

The dialects we examined were Midland and Northern American English. The Northern dialect, spoken in the upper midwestern United States, is characterized by the Northern Cities vowel shift (Labov, 1998; Labov, Ash, & Boberg, 2006), which is schematized in the right panel of Fig. 1. The Midland dialect, spoken in the lower midwestern United States, is characterized by the fronting and lowering of /ɔ/ (approaching, but not necessarily merging with, /ɑ/) and back-vowel fronting (Labov, 1998; Labov et al., 2006), as shown in the left panel of Fig. 1.

The experiment was conducted with Midland and Northern listeners in the Midland region to allow us to examine the potential interactions among different types of dialect familiarity. The Midland dialect is a subdialect of General American English (Labov, 1998) and has fewer dialect-specific vowel shifts that distinguish it from standard American English than the Northern dialect (see Fig. 1). The shifts in the Midland dialect also generally preserve the structure of the vowel space, with the exception of the potential low-back merger, whereas the Northern Cities shift results in the rotation and restructuring of the low and front parts of the vowel space, respectively. Thus, in the experimental context, the Midland dialect was both contextually relevant as the local dialect and socially salient as the objectively more standard variety for all listeners. For the Midland listeners, the Midland dialect is also the native dialect, whereas for the Northern listeners, the Northern dialect is the native dialect. Thus, the Midland listeners were predicted to exhibit

[1] Following the previous research on which this study is based, we assume an exemplar-theoretic framework. However, the primary results may also be explained by an abstract model of lexical representation, in which the recognition and encoding processes can be distinguished. For example, in a model involving activation and competition among abstract lexical units, such as Cohort Theory (Marslen-Wilson & Welsh, 1978), TRACE (McClelland & Elman, 1986), or Shortlist (Norris, 1994), variation in encoding across dialects could be captured as variation in residual activation of lexical categories following successful recognition.

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