



## Research Article

## Regional variation in temporal organization in American English

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## ABSTRACT

The goal of the current study was to explore the temporal organization of six regional dialects of American English to gain a better understanding of the perceptual impressions of speaking rate variation. The study further examines whether regional dialects form different groupings based on their segmental vs. global temporal characteristics. Acoustic measures included articulation rate, pause frequency and duration, and vowel and consonant duration variability. The results revealed that Southern American English is characterized by a slow overall articulation rate, long pauses, and highly variable syllable-to-syllable vowel durations, whereas the New England dialect is characterized by a fast overall articulation rate, short pauses, and highly variable syllable-to-syllable consonant durations. The patterns for the other dialects are more mixed: the Northern and Western dialects are characterized by low variability vowel durations, the Midland dialect shares a slow articulation rate with the Southern dialect, and the Mid-Atlantic dialect exhibits no unique temporal properties among those examined. Thus, temporal variation in regional dialects of American English is orthogonal to vowel variation, in which New England, Midland, and Western dialects are often characterized together as “General American”. Taken together, the results are consistent with the stereotype that Southerners talk slowly and Northerners talk quickly and suggest that pausing and segmental duration variability may contribute to the perceived speaking rate differences.

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## 1. Introduction

One of the many stereotypes about regional varieties of American English is that Southerners talk slowly and Northerners, particularly Northeasterners, talk quickly (Niedzielski & Preston, 2003). However, a deeper understanding of what contributes to these perceptions is lacking and the empirical sociophonetic research on one aspect of temporal variation in American English, namely speaking rate differences, is somewhat mixed. Although Jacewicz and colleagues (Jacewicz, Fox, O'Neill, & Salmons, 2009; Jacewicz, Fox, & Wei, 2010) observed faster speaking rates among Wisconsin talkers than North Carolina talkers, consistent with this stereotype, Ray and Zahn (1990), Byrd (1994), and Clopper and Smiljanic (2011) all reported marginal or null results in comparisons between Southern and Northern or Midwestern varieties. However, Byrd (1994) and Clopper and Smiljanic (2011) both observed more frequent pausing among Southern talkers than talkers from other regions and Jacewicz et al. (2010) and Kendall (2009) reported longer pauses among Southern talkers than Northern or Midland talkers, respectively. Focusing on segmental duration variation across regional varieties, Clopper, Pisoni, and de Jong (2005) found that Southern lax vowels are longer than Northeastern and Western lax vowels, but that tense vowels do not differ in duration across dialects. Similarly, Jacewicz, Salmons, and Fox (2007) found that Southern front vowels are longer than Northern front vowels. Taken together, these results suggest that the speaking rate stereotype may be based on factors other than overall articulation rate, including pause frequency, pause duration, and vowel duration.

Recently, White, Mattys, and Wiget (2012) explored listener sensitivity to durational cues in differentiating between different languages and between varieties of the same language. They used “bleached” sentences in which information about specific segments is removed but the overall durational patterns are retained (following Ramus, Dupoux, & Mehler, 2003). In White et al.'s (2012) study, English listeners were predictably able to differentiate between English and Spanish, which are known to exhibit

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substantial timing differences. Surprisingly, however, they were also able to differentiate among varieties of British English, suggesting that a host of durational cues, including speech rate, as well as durational contrasts and utterance-final lengthening, plays a role in categorization between and within languages. Given the evidence that variation in temporal patterns contributes to the differentiations among varieties of the same language, the goal of the current study was to explore in detail variability in temporal organization, beyond speaking rate, including pausing and variability in consonant and vowel interval durations, in six regional varieties of American English. The results will enhance our understanding of speech properties that underlie differentiation of regional American English varieties beyond typically-examined vowel characteristics (e.g., Clopper et al., 2005; Labov, Ash, & Boberg, 2006; Thomas, 2001) and provide further support for the empirical basis of the widely held social stereotypes about regional differences in speaking rate. This study also sheds new light on the relationships of similarities and differences among these American English varieties. A direct comparison of six regional varieties expands on previous studies which have typically examined only two or three dialects (cf., Byrd, 1994). In addition, the comprehensive analysis of vowel and consonant duration variability, as a metric of temporal organization, provides a novel perspective on regional temporal organization variation in American English.

Variation in vowel and syllable duration has been examined for a number of national, regional, and ethnic varieties of English and the observed differences are typically attributed to contact with languages with less syllable-to-syllable vowel variation. For example, British English exhibits more variation in vowel duration than Singapore English (Deterding, 2001; Low, Grabe, & Nolan, 2000) or New Zealand English (Warren, 1998), presumably due to ongoing contact with Mandarin in Singapore and historical contact with Maori in New Zealand. Comparisons between Maori English and Pakeha English (Pakeha is used to refer to New Zealanders of European descent) in New Zealand provide further evidence for the role of language contact in this variation. Maori English exhibits less vowel reduction than Pakeha English (Holmes & Ainsworth, 1996, 1997) and therefore less vowel and syllable duration variability (Szakay, 2006; Warren, 1998). Pakeha English also exhibits a reduction in syllable duration variation over time (Nokes & Hay, 2012), suggesting that the temporal organization of New Zealand English is changing as a result of contact with Maori and Maori English. Language contact may also explain the variability observed in temporal organization in ethnic varieties of North American English. Jamaican English, Hispanic English, Native American English (Cherokee and Lumbee), and Chinese-American English have all been described as exhibiting less variability in syllable duration than white American English as a result of influences from substrate or heritage languages (Coggshall, 2008; Newman & Wu, 2011; Thomas & Carter, 2006). Similar variation has been observed in British English, in which urban varieties spoken by ethnically heterogeneous populations exhibit less vowel duration variability than suburban varieties spoken by homogeneous British populations (Torgersen & Szakay, 2012). White and Mattys (2007) have also demonstrated that regional varieties of British English differ in the degree of reduction of unstressed syllables and that these differences contribute to variation in temporal organization.

The metrics used in these previous studies to explore variability in vowel and syllable duration were originally developed to test the purported rhythmic distinction between stress-timed and syllable-timed languages (e.g., Abercrombie, 1967). According to this hypothesis, syllable-timed languages, such as Spanish, have isochronous syllables and stress-timed languages, such as English, have isochronous stressed syllables. Furthermore, stress-timed languages typically exhibit vowel reduction processes and a large number of syllable types, whereas syllable-timed languages typically exhibit simpler syllable types and little vowel reduction. Syllable, vowel, and consonant durations should therefore be less variable in a syllable-timed language than a stress-timed language. A number of metrics have been proposed to capture this difference in segment and syllable variability. Ramus, Nespors, and Mehler (1999) proposed %V (the proportion of vocalic intervals),  $\Delta V$  (the standard deviation of vocalic interval duration), and  $\Delta C$  (the standard deviation of consonant interval duration) and observed a negative correlation between %V and  $\Delta C$  across languages. Languages with a relatively large proportion of vocalic segments (high %V) and relatively little variability in consonant interval duration (low  $\Delta C$ ) were identified as syllable-timed and languages with a relatively low %V and a relatively high  $\Delta C$  were identified as stress-timed. Dellwo and Wagner (2003) noted that the  $\Delta C$  and  $\Delta V$  metrics were strongly correlated with speaking rate and Dellwo (2006) therefore proposed the *VarcoC* and *VarcoV* metrics, which normalize  $\Delta C$  and  $\Delta V$ , respectively, for speaking rate. Grabe and Low (2002) proposed an additional metric, the pairwise variability index (PVI), to capture the greater variability in syllable duration in stress-timed languages than syllable-timed languages. The PVI is the average relative duration of consecutive syllables and a high PVI therefore corresponds to regular alternations between long and short syllables. Although languages like English and German do not exhibit strictly alternating long and short syllables, they do exhibit substantial vowel-to-vowel duration variability due to lexical stress and phonological vowel length distinctions between tense and lax vowels (English), long and short vowels (German), and monophthongs and diphthongs (English and German). English and German therefore have higher vowel PVI values than languages like French and Spanish which exhibit less vowel-to-vowel duration variability. Grabe and Low (2002) further proposed normalizing the vowel PVI metric for speaking rate, but argued that the raw consonant PVI metric was sufficient to capture rhythmic variability across languages.

Although most of the previous research documenting within-language variability in temporal organization has relied on these metrics for analysis, several recent studies have raised critical questions about their reliability and validity. In particular, the metrics exhibit substantial variability within languages when different speaking styles (e.g., read vs. conversational speech) and different talkers are compared (Arvaniti, 2009, 2012; Loukina, Kochanski, Rosner, Keane, & Shih, 2011; Nolan & Asu, 2009; Smiljanic & Bradlow, 2008; Wiget, White, Schuppler, Grenon, Rauch, & Mattys, 2010). More fundamentally, however, the different metrics often point to different interpretations of stress- vs. syllable-timing because they can also capture differences in vowel reduction, vowel length contrasts, resolution of vowel–vowel hiatus, and consonant cluster simplification (Dauer, 1983; Fagyal, 2010). This latter kind of variation is exactly how we expect regional dialects of American English to vary, however, so we used these metrics to explore this aspect of variation in temporal organization in the current study.

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