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Effects of gender and regional dialect on prosodic patterns in American English

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Abstract

While cross-dialect prosodic variation has been well established for many languages, most variationist research on regional dialects of American English has focused on the vowel system. The current study was designed to explore prosodic variation in read speech in two regional varieties of American English: Southern and Midland. Prosodic dialect variation was analyzed in two domains: speaking rate and the phonetic expression of pitch movements associated with accented and phrase-final syllables. The results revealed significant effects of regional dialect on the distributions of pauses, pitch accents, and phrasal-boundary tone combinations. Significant effects of talker gender were also observed on the distributions of pitch accents and phrasal-boundary tone combinations. The findings from this study demonstrate that regional and gender identity features are encoded in part through prosody, and provide further motivation for the close examination of prosodic patterns across regional and social varieties of American English.

Keywords

prosody; intonation; regional dialects; gender; American English

1.0 Introduction

Historically, the focus of most research on regional variation in American English has been on lexical and segmental sources of variability based on fieldworker transcriptions of interview speech (e.g., the Linguistic Atlas projects, the Dictionary of American Regional English). Although more recent research has moved away from impressionistic transcriptions and has adopted acoustic analysis techniques to document and describe regional and ethnic variation in the United States, the research remains largely focused on segmental sources of variability, particularly in the vowel system. For example, Thomas' (2001) monograph provided acoustic vowel spaces for almost 200 talkers in the United States from three broad dialect regions and four ethnicities, and Labov, Ash, and Boberg's (2006) *Atlas of North American English* described patterns of regional phonological variation in urban areas in the United States and Canada based on an acoustic analysis of the

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vowel systems of over 400 talkers. While these ambitious projects, and other smaller-scale studies, provide invaluable information about lexical and segmental variation in American English, prosodic variation in American English dialects has remained largely unexplored, despite intuitions that prosodic phenomena contribute greatly to our impression of regional and social differences. In this paper, we aim to fill this gap by exploring regional and gender effects on the prosodic characteristics of two dialects of American English: Midland and Southern.

Prosodic variation has been observed across dialects in numerous historically unrelated languages, including Basque (Hualde, Elordieta, Gaminde, & Smiljanic 2002), Danish (Grønnum 1990), Dutch (Gussenhoven 2000; Gussenhoven & van der Vliet 1999; Haan & van Heuven 1999), German (Grønnum 1990; Selting 2004), Irish (Dalton & Ní Chasaide 2003, 2005), Italian (Grice, D'Imperio, Savino, & Avesani 2005; Prieto, D'Imperio, & Fivela 2005), Mayali (Bishop & Fletcher 2005), Norwegian (Gooskens & Heeringa 2006), Portuguese (Frota & Vigario 2001), Serbian and Croatian (Smiljanic 2004, 2006), Spanish (Beckman, Diaz-Campos, McGory, & Morgan 2002; Elordieta & Calleja 2005), and Swedish (Bruce 2005; Grønnum 1990). These studies have demonstrated that the range of prosodic phenomena along which dialects can vary includes rhythmic characteristics, type and frequency of occurrence of phonologically contrastive tonal categories, their phonetic implementation, and their combination into phrase-level tunes, as well as the interpretation of those tunes. The results of these studies, furthermore, show that prosodic differences across dialects can be as large as across historically unrelated languages or can involve subtle phonetic differences.

Similar to the studies of prosodic characteristics in dialects of other languages, studies of prosodic variation in varieties of English have examined a range of phenomena. For example, speaking rate differences between New Zealand and American English varieties were examined by Robb, Maclagan, and Chen (2004), who found that New Zealand English speech was significantly faster than American English speech in terms of overall speaking rate (including pauses) and articulation rate (excluding pauses). Robb et al. (2004) attributed the effect of dialect on speaking rate to differences in vowel quality between New Zealand and American English and suggested that those vowel quality differences may also produce differences in rhythm across these varieties, although they did not explicitly test their hypothesis. Within the United States, Southern American English is often stereotyped as being slower than other regional varieties (Preston 1998). To test the validity of this stereotype, Ray and Zahn (1990) investigated the speaking rate in words per minute of men and women from three regional dialects of American English (Northern, Southern, and Western) in two contexts (conversational speech and public speaking). They did not observe any significant differences in speaking rate due to dialect or gender. However, as expected, conversational speech was faster than public speaking for all of the speakers. More recently, Jacewicz, Fox, and O'Neill (2009) observed significant effects of regional dialect on articulation rate (excluding pauses). The articulation rate of talkers from Wisconsin was faster than the articulation rate of talkers from North Carolina in both short read sentences and in interview speech, consistent with the stereotype that Southern speech is slower than Northern speech.

Variation in the inventory of categorical tonal distinctions and their phonetic implementation, i.e., the alignment of tones with syllables and phrase boundaries, and the pitch range of particular accents, have been examined for varieties of English as well (e.g., Grabe & Post, 2002; Grabe, Post, Nolan, & Farrar, 2000; and Van Leyden, 2004 for British English varieties). Arvaniti and Garding (2007) examined the presence of a three-way pitch accent contrast (H* vs. L+H* vs. L*+H) and its phonetic realization under increased emphasis in two American English varieties: Minnesota and southern California English.

Their results revealed that the two dialects differed in both the inventory of the pitch accents and in their realization. While southern California speakers produced all three accents, Minnesota speakers did not distinguish between the H* and L+H* pitch accents, and produced predominantly L+H* and L*+H accents. Southern California speakers also showed later f0 peak alignment than Minnesota English speakers in bitonal pitch accents.

While prosodic variation across dialects of English has recently received some attention, less is known about gender as a sociolinguistic variable that affects prosody. Barry (2007) explored the phonology of high-rising terminals (HRTs), or rising intonation at the end of statements, in southern British English and southern California English. In addition to finding differences in the frequency of use and the phonetic implementation of HRTs in the two varieties, she found gender differences as well. Females produced more HRTs than males overall and the female HRTs exhibited larger pitch ranges than the male HRTs. Similarly, Guy et al. (1986) and Britain (1992) found that females produced more HRTs than males in Australia, and Warren (2005b) reported more female than male HRT productions in New Zealand. Warren and Daly (2000) also observed that female speakers used higher pitch for final rises in intonation questions (i.e., questions that are not marked syntactically) in New Zealand. Finally, Daly and Warren (2001) explored effects of gender, speech task (sentence reading vs. story reading), and sentence type (statement vs. question) on pitch range variation. They found that all three factors had an effect on pitch range and pitch dynamism. The gender differences were stronger in the story-telling task and were presumably due to differences between male and female participants' approach to the task (e.g., expression of emotion, engagement, attitude, involvement with the discourse partner, etc.). All of these studies demonstrated that gender identity is in part encoded through prosodic patterns and suprasegmental cues. Thus, in the current study, we also consider talker gender as a variable in our analysis of prosodic variation in American English.

Taken together, these studies suggest that prosodic sources of variation are an important component for distinguishing regional and social dialects within a given language and that these features can range from local tune-text alignment differences to global rhythmic and prosodic type differences. Furthermore, they demonstrate that detailed acoustic-phonetic investigation of prosodic features can yield important insights into the nature of variation among language varieties as well as the role of prosody in the grammar. In the current study, we set out to examine the effects of regional dialect and gender on prosodic patterns in two varieties of American English: Midland and Southern. The Midland dialect was selected to represent a variety of General American English (Labov 1998). In contrast, the Southern dialect was selected to compare with the Midland dialect because it is traditionally stereotyped as having interesting and distinctive prosodic properties, such as a slower speaking rate (Preston 1998) and more extreme pitch excursions (Feagin 1997). Although not the two most strongly differentiated varieties of American English, these two varieties serve as a starting point for a larger systematic comparison of prosodic variation across dialects of American English. We report results on speaking rate and the frequency and distribution of pitch accents, phrase accents, and boundary tones in the two dialects. The results revealed that while some aspects of prosody (speaking rate) seem to be common across both varieties and genders, other elements of prosody (distribution and frequency of pauses, pitch accents, and phrasal-boundary tone combinations) vary across dialects and genders.

2.0 Methods

2.1 Talkers

Five male and five female talkers[1] from each of two dialects of American English (Midland and Southern) were selected for analysis in this study from the Nationwide Speech Project

corpus (Clopper & Pisoni 2006), for a total of 20 talkers. Geographically, the Midland dialect extends from western Pennsylvania to Nebraska, and includes the southern Midwestern United States, including most of Ohio, Indiana, Illinois, Iowa, Missouri, Nebraska, and Kansas. The Midland talkers in this study were from central Indiana (N = 9) and Missouri (N = 1). The Southern dialect encompasses what is traditionally thought of as the American South, and stretches from Virginia to Texas. The Southern talkers in this study were from Kentucky, including the suburbs of Louisville in Indiana (N = 5), North Carolina (N = 1), South Carolina (N = 1), Alabama (N = 1), and Texas (N = 2).

The 20 selected talkers were white, monolingual native speakers of American English between the ages of 18 and 25 years old at the time of recording. Each talker had lived exclusively in his or her dialect region until the age of 18 years old, and both parents of each talker were also raised in the same region. At the time of recording, the talkers were students at Indiana University in Bloomington. Thus, the talkers were relatively homogeneous with respect to age, ethnicity, language experience, education, and socioeconomic status. To reduce the effects of dialect leveling, all of the talkers had lived in Bloomington for less than two years at the time of recording. However, the talkers may have accommodated to the experimenter during the recording session (see e.g., Giles & Powesland 1997 for a discussion of talker accommodation). Therefore, our findings may underestimate prosodic dialect differences, but will serve as a useful baseline for comparison with future research on a more diverse sample of Midland and Southern talkers.

2.2 Speech Samples

The speech samples selected for analysis were two read passages of connected speech, the Rainbow passage (Fairbanks 1940) and the Goldilocks passage (Stockwell 2002). The texts of both passages are shown in the Appendix. Each talker read both passages as part of a longer recording session that took place in a sound-attenuated booth and also included isolated words, sentences, and interview speech. While read speech typically exhibits fewer stigmatized variants across talkers and dialects than interview speech (e.g., Labov 1972), read speech was used to control segmental content across talkers. Our findings of prosodic dialect variation in these read speech samples suggest that even more variation could be observed in more spontaneously produced speech samples, which we will explore in future work. Due to a technical recording error, the initial phrase “Once upon a time” from the Goldilocks passage was unanalyzable for many of the talkers. We therefore excluded this phrase from the analysis. Speaking rate in the passages was analyzed acoustically and the intonation contours of the passages were analyzed using a modification of the ToBI transcription system.

2.3 Speaking Rate Analysis

We conducted an auditory and acoustic analysis of speaking rate and pause distribution using Praat (Boersma & Weenink 2006). Speaking rate was defined as syllables per second of fluent, connected speech, with hesitations, backtracking, and pauses longer than 100 ms excluded. The number of syllables produced by each talker was determined from the actual productions, including lexical and/or morphological additions, deletions, and substitutions relative to the provided text. Pauses were defined as periods of silence longer than 100 ms, following Wennerstrom and Siegel’s (2003) analysis of pauses in natural conversation.

Pause distribution was measured in terms of pause frequency and pause duration. Pause frequency was defined as the number of pauses longer than 100 ms per Intonational Phrase

[1]Note that throughout this manuscript the variable distinguishing males and females is referred to as “gender” rather than “sex,” based on the self-report of the participants.

(IP), as transcribed in a ToBI analysis of the stimulus materials (see section 2.4). In many cases, pauses longer than 100 ms occurred between IPs (and all pauses longer than 100 ms were taken as evidence of an IP boundary), but in some cases, IP boundaries were marked by a pause shorter than 100 ms or by no perceptible pause at all. Thus, this measure of pause frequency can also be interpreted as the proportion of IPs marked by a pause longer than 100 ms. Pause duration was defined as the mean duration of all pauses longer than 100 ms. Each measure was calculated separately for each passage for each talker.

2.4 Phonetic Transcription of f0 Movement

We base our analysis of intonation patterns in the two dialects on the Tone and Break Indices (ToBI) transcription system originally intended for Mainstream American English (MAE; Beckman & Ayers Elam 1997; Beckman, Hirschberg, & Shattuck-Hufnagel 2005; Silverman et al., 1992). Unlike the original ToBI, however, we adopt a phonetic approach to describing f0 movement in the two varieties under investigation (cf., Glasgow ToBI, Mayo et al. 1997). Although the ToBI system was designed to capture phonological properties of intonation systems, our analysis remains agnostic about the intonational phonological inventories of the two varieties at this point. The modified transcription system adopted in this study allows us to directly compare the two language varieties without assuming anything about their phonological inventories and to capture the differences in phonetic realization of the pitch contours. In this way, the present level of analysis is more akin to the phonetic tier used in the analysis of the Intonational Variation in English (IViE) project (e.g., Grabe et al., 2000) and to the phonetic transcription of tone realization proposed for Korean ToBI that is separate from the phonological analysis (Jun 2005). The results of such an analysis can serve as a basis for proposing phonological inventories across language varieties as well as for more detailed quantitative measurements of intonational patterns. The combined phonetic and phonological analyses can then provide us with insights into the phonetics-phonology mapping in these language varieties. These latter points will be addressed in future work.

In our analysis, we use the labels for pitch accents, phrase accents, and boundary tones given for MAE_ToBI (e.g., L*, H*, L+H*, L−L%, etc.). We also use two levels of phrasing as specified in ToBI: intonational phrases (IPs) and intermediate phrases (ips). Every IP is composed of one or more ips. Prominent syllables within each ip are marked by pitch accents. Pitch accents associate with lexically stressed syllables and each ip must contain at least one pitch accent.

The read passages were first marked for prominent syllables and phrase boundaries. The f0 movements associated with the prominent syllables and phrase boundaries were then labeled with pitch accents on stressed syllables (indicated by *), phrase accents at ip boundaries (indicated by −), and boundary tones at IP boundaries (indicated by %). The presence or absence of pitch accents, phrase accents, and boundary tones was determined following the *Guidelines for ToBI Labelling* (Beckman & Ayers Elam 1997). The assignment of specific labels (e.g., H*, L+H*, L*+H, or L*) to the f0 movements was based on predominantly phonetic criteria, including visual inspection of the f0 track and repeated listening. As Arvaniti and Garding (2007) have shown, dialects of American English differ in their phonological inventories. Given that we do not have access to the meanings that the talkers who produced the stimulus materials intended, our data and analyses do not allow us to differentiate whether, for instance, two contours contain distinct phonological categories that can distinguish meaning or a different phonetic instantiation of the same phonological category in these dialects. Therefore, we use this inventory as shorthand for describing pitch contours rather than claiming anything about their status in the phonological system of these dialects or their meaning (Warren 2005a).

For f0 changes associated with the accented syllables, we assume four phonetic types with the following correspondences: a low valley followed by a steep rise to a peak, with the peak occurring after the accented syllable (L*+H), a low valley followed by a steep rise to a peak, with the peak occurring during the accented syllable (L+H*), a high target on the accented syllable without a preceding steep rise (H*), and a low flat contour or valley on the accented syllable (L*). Note that we use the star notation (*) to indicate the tonal target of the f0 contour (H or L) that is phonetically aligned with the accented syllable[2]. For example, L*+H and L+H* pitch accents were distinguished based on the location of the f0 peak (after or within the accented syllable, respectively), rather than on the perceived meaning of the accented word in the discourse as new, contrastive, etc. When the peak of a L+H contour occurred at the syllable boundary between the accented syllable and the following syllable, the accent was transcribed as L+H*. The alignment difference between L+H* and L*+H pitch accents is shown in Figures 1 and 2 for two Midland female talkers. In Figure 1, the f0 peak of the rising pitch contour associated with *one* is realized on the stressed syllable, just after the stressed vowel, and the contour is labeled as L+H*. In Figure 2, the f0 peak of the rising pitch contour associated with *one* is realized after the stressed syllable, at the beginning of *morning*, the f0 valley is realized on the stressed vowel, and the contour is labeled as L*+H. A sequence of H* labels associated with the f0 contour is shown in Figures 3 and 4 for comparison.

Two phrase accents were used to delineate intermediate phrases (ips): f0 plateau or rise (H−) and f0 fall (L−). Finally, for the phrasal-boundary tone combinations that delineate IPs, we assume four phonetic types that are sequences of a phrase accent (H− or L−) and a boundary tone (H% or L%): a fall to the bottom of the speaker's range (L−L%), a high rise (H−H%), a plateau (H−L%), and a fall followed by a rise (L−H%). The schematic f0 contours provided by Pierrehumbert and Hirschberg (1990) were used as a guide for transcribing sequences of pitch accents, phrase accents, and boundary tones at IP boundaries. The L−L% phrasal-boundary tone combination is shown in Figure 4, the H−H% phrasal-boundary tone combination is shown in Figure 3, the H−L% phrasal-boundary tone combination is shown in Figures 1 and 2, and the L−H% phrasal-boundary tone combination is shown in Figure 5.

Each author transcribed half of the speech samples of each passage, gender, dialect, and talker. Although the ToBI transcription system has been shown to be highly reliable, even for novice transcribers (Pitrelli, Beckman, & Hirschberg 1994), several steps were taken to ensure comparable transcriptions across experimenters. First, two passages were transcribed independently by each author and then compared to develop a shared transcription procedure. Second, during the initial pass of transcription, each author marked difficult or problematic transcriptions for further discussion and those sections were examined by both authors together. Third, after the initial pass of transcription, the authors sat together and examined the transcriptions of an additional 18 of the 40 passages (45%) to ensure that the transcriptions produced by one author were mutually acceptable to both authors. Fourth, the final transcriptions of 10 of the 40 passages (25%) were analyzed to ensure consistent alignment of pitch accents, phrase accents, and boundary tones with the text across the two transcribers. Finally, given that independent transcriptions were not available for most of the passages, inter-transcriber reliability was not explicitly assessed statistically. However, transcriber was entered as a factor in all of the statistical analyses reported below to ensure that the reported results were not due to inter-transcriber differences. Transcriber was not a significant factor for any of the measures examined. Thus, the transcription process involved substantial communication between the two authors to ensure a consistent and replicable

[2]In ToBI notation, * indicates the phonological alignment of the tonal target with the stressed syllable. This phonological association can result in a phonetic alignment of the tonal target that does not coincide with the accented syllable (e.g., the f0 peak of a H* pitch accent can in some contexts be realized on the post-tonic syllable).

protocol for transcription across all of the speech samples, and the statistical analysis confirms that the results reported here most likely are the result of true dialect and gender differences.

The measures that were obtained from the ToBI transcription were overall phrasal-boundary tone combination frequency (number of IPs), overall phrase accent frequency (number of IP-medial ips), and overall pitch accent frequency (number of pitch accents), as well as frequency counts for each of the individual phrasal-boundary tone combinations (L-L%, L −H%, H−L%, and H−H%), phrase accents (H−, L−), and pitch accents (H*, L*, L+H*, and L*+H). As noted above, phrasal-boundary tone combinations were treated as sequences of a phrase accent (H−, L−) and boundary tone (H%, L%). The phrasal-boundary tone combination analyses examined these sequences as units, and phrase accents in IP-final position were not included in the separate phrase accent analysis. Therefore, the phrase accent analysis included only those phrase accents that were not IP-final. As with the acoustic measures of speaking rate, the ToBI transcription measures were calculated separately for each passage for each talker.

3.0 Results

3.1 Speaking Rate and Pause Distribution

Speaking rate differences were not observed between the two dialects, despite the intuition that Southern talkers speak more slowly than talkers from other dialects of American English. The mean speaking rate (in syllables per second of fluent, connected speech) is shown in the first row of Table 1 for each dialect for each gender, collapsed across passage. A repeated measures ANOVA on speaking rate with passage as a within-subject factor and dialect and gender as between-subject factors confirmed no significant main effects or interactions for these factors on speaking rate.

Similarly, no effect of dialect was observed on mean pause duration. As shown in the second row of Table 1, the mean duration of all pauses over 100 ms was approximately 455 ms for both dialects for both genders, collapsed across passage. A repeated measures ANOVA on mean pause duration with passage as a within-subject factor and dialect and gender as between-subject factors confirmed no significant main effects or interactions for these factors on pause duration.

However, pause frequency was affected by both dialect and gender. As shown in the third row of Table 1, the Southern male talkers produced more pauses per IP than the Southern female talkers or the male or female Midland talkers. Thus, whereas Southern male IPs were marked by a pause longer than 100 ms over 80% of the time, IPs were marked by a pause longer than 100 ms only 60-70% of the time for the Southern female talkers and the male and female Midland talkers. A repeated measures ANOVA on pause frequency with passage as a within-subject factor and dialect and gender as between-subject factors revealed a significant gender × dialect interaction ($F(1, 16) = 9.7$, $p < .01$). None of the main effects and none of the other interactions were significant. Posthoc independent sample t-tests confirmed significantly more pauses per IP for the Southern male talkers than the Southern female talkers ($t(8) = 4.1$, $p = .004$), the Midland male talkers ($t(8) = 3.0$, $p = .018$), and the Midland female talkers ($t(8) = 2.5$, $p = .04$). No other pairwise differences were significant. Given that only pauses longer than 100 ms in duration were included in the pause frequency measure, the higher pause frequency for the Southern male talkers suggests that they produced more pauses longer than 100 ms between IPs than the other talkers, who may have produced shorter pauses (less than 100 ms) to mark IP boundaries.

3.2 Pitch Accent, Phrase Accent, and Boundary Tone Frequency

The total number of phrasal-boundary tone combinations, IP-medial phrase accents, and pitch accents for the two passages are shown in Table 2. Dialect and gender differences in overall phrasal-boundary tone combination, phrase accent, and pitch accent frequency were not observed, suggesting that all of the talkers in this study produced a similar number of IPs, ips, and accented words across the two passages. A series of chi-square tests confirmed no effects of dialect or gender on overall phrasal-boundary tone combination, phrase accent, or pitch accent frequency. This result is not surprising given that the task involved reading a passage that included punctuation, which may have shaped the phrasing of the text in a similar way for all of the talkers. However, a significant effect of passage was observed for overall phrasal-boundary tone combination frequency ($\chi^2 = 98.8$, $df = 1$, $p < .001$), overall phrase accent frequency ($\chi^2 = 7.7$, $df = 1$, $p < .01$), and overall pitch accent frequency ($\chi^2 = 267.0$, $df = 1$, $p < .001$). These results simply reflect the relative length of the two passages: the Goldilocks passage was longer than the Rainbow passage and therefore provided more opportunities for marking prominences and boundaries.

A series of mixed-effects logistic regression analyses was conducted to examine the frequency distributions of the different phrase accent plus boundary tone sequences (L−L%, L−H%, H−L%, and H−H%), phrase accents in non-IP final position (H−, L−), and pitch accents (H*, L*, L+H*, and L*+H). In each analysis, talker dialect, talker gender, passage, and all possible two- and three-way interactions were treated as fixed independent variables, individual talker was treated as a random independent variable, and frequency counts of the prosodic phenomena were treated as dependent variables. Models in which the intercept was allowed to vary for each talker were compared to models in which both the intercept and the passage main effect were allowed to vary for each talker. In all cases, the simpler model with only the intercept term for the random talker variable was selected for interpretation because no significant differences in model fit were observed between the two models. For the phrasal-boundary tone combination and pitch accent analyses, in which four variants of tones or accents were possible, separate analyses were conducted to compare the frequency counts of each tone (e.g., L−L%) to the combined frequency counts of the other tones (e.g., L−H%, H−L%, and H− H%). For the IP-medial phrase accent analysis, in which two variants of accents were possible, one analysis was conducted comparing frequency counts of L− to H−.

The results of the mixed-effects regression analyses on phrasal-boundary tone combination type are summarized in Table 3. For the L−L% phrasal-boundary tone combination, passage emerged as a significant factor ($z = 2.4$, $p = .014$). The Rainbow passage exhibited a higher relative frequency of L−L% phrasal-boundary tone combinations compared to the Goldilocks passage. A talker dialect × passage interaction was observed for both the H−L% ($z = −2.5$, $p = .011$) and the L−H% ($z = 2.7$, $p = .008$) phrasal-boundary tone combinations. Both dialects showed more frequent use of the H−L% phrasal-boundary tone combination in the Goldilocks passage than the Rainbow passage, but the effect of passage was smaller for the Midland talkers than the Southern talkers. Figures 1 and 2 show examples of the H−L% phrasal-boundary tone combination produced by Midland talkers reading the Goldilocks passage.

The Midland talkers also showed more frequent use of the L−H% phrasal-boundary tone combination in the Goldilocks passage relative to the Rainbow passage, suggesting more rising phrasal-boundary tone combinations overall for the Midland talkers in the Goldilocks passage than the Rainbow passage. The Southern talkers, however, showed the opposite pattern: they produced proportionately more L−H% phrasal-boundary tone combinations in the Rainbow passage than the Goldilocks passage. A main effect of gender was also observed for the L−H% phrasal-boundary tone combination ($z = −2.2$, $p = .027$). The female

talkers produced relatively more L−H% phrasal-boundary tone combinations than the male talkers. An example of the female Midland L−H% pattern in the Goldilocks passage is shown in Figure 5. No significant main effects or interactions were observed for the H−H% phrasal-boundary tone combination.

The results of the mixed-effects regression analysis on phrase accents are summarized in Table 4. The main effect of dialect ($z = -3.0$, $p = .002$) and the dialect × gender interaction ($z = 2.6$, $p = .010$) were significant. The Midland talkers produced relatively more L− phrase accents than the Southern talkers. However, this effect was carried by the female talkers. Female Midland talkers produced relatively more L− phrase accents than the female Southern talkers, suggesting that while Southern female talkers frequently marked ips with an f0 plateau or a rise (H−), Midland female talkers were more likely to mark ips with an f0 fall (L−). Midland and Southern male talkers did not differ in terms of the frequency of occurrence of the L− phrase accent.

The results of the mixed-effects regression analyses on pitch accents are summarized in Table 5. Passage and gender were significant factors in the frequency of H* productions ($z = -4.5$, $p < .001$ for passage; $z = 2.6$, $p = .011$ for gender). The Goldilocks passage exhibited relatively more H* pitch accents than the Rainbow passage and the male talkers produced relatively more H* pitch accents than the female talkers. These results suggest that the female talkers produced more contour pitch accents (L+H* and L*+H) than the male talkers.

Main effects of passage ($z = 5.3$, $p < .001$) and gender ($z = -2.1$, $p = .033$) were also observed for the L*+H pitch accent. As expected based on the results of the H* analysis, relatively more L*+H pitch accents were produced in the Rainbow passage than the Goldilocks passage and by female talkers than male talkers. In addition, for the L*+H pitch accent, a significant passage × gender interaction ($z = -2.1$, $p = .034$) was observed. Female talkers produced relatively more L*+H pitch accents, particularly when reading the Rainbow passage, and male talkers produced relatively fewer L*+H pitch accents, particularly when reading the Goldilocks passage. No significant main effects or interactions were observed in the L+H* analysis, suggesting that the female preference for contour pitch accents compared to male talkers is carried predominantly by their preference for L*+H pitch accents. The analysis of the L* pitch accent revealed a significant passage × talker dialect interaction ($z = 2.7$, $p = .006$). Both dialects produced relatively more L* pitch accents in the Rainbow passage than the Goldilocks passage, but this effect was stronger for the Southern talkers than the Midland talkers.

4.0 Discussion

The results of the current study revealed significant effects of dialect and gender, often in combination, on the prosodic patterns of American English read speech. Like Ray and Zahn (1990), but unlike Jacewicz et al. (2009), the speaking rate analyses in the current study did not reveal that Southern talkers speak more slowly than talkers of other dialects. The talkers in Jacewicz et al.'s (2009) study were more homogeneous than the talkers in either Ray and Zahn's (1990) study or the current study, which may account for the differences in the results. In addition, Jacewicz et al. (2009) compared two dialects that are strongly differentiated segmentally (Northern and Southern), whereas the current study examined more segmentally similar dialects (Midland and Southern), which may also be prosodically similar. Finally, Jacewicz et al. (2009) did not describe how pauses were defined in their study, which makes it difficult to directly compare our results to theirs. Our speaking rate measure was also a global measure taken over the entire passage. Given that the number of IPs did not vary significantly across dialects, it is unlikely that our global speaking rate masked local variation due to phrase length or phrase-final lengthening within IPs.

However, in future work we plan to examine both global and local speaking rate differences across dialects in read and conversational speech.

Despite the lack of an overall effect of speaking rate in the current study, Southern male talkers paused more frequently than either Southern females or male or female Midland talkers, which may also contribute to the stereotype that Southern speech is slower than the speech in other regions. More frequent and longer pauses may give the impression of slower speech, despite similar rates of articulation between pauses across dialects. In addition, Southern vowels have been shown to be longer on average than Northern vowels (Clopper, Pisoni, & de Jong 2005; Jacewicz, Salmons, & Fox 2007), which may also contribute to the perceived rate differences between dialects. Further research is needed to examine the effects of articulation rate, pause distribution, and vowel duration on perceived speaking rate across dialects in read and conversational speech.

The results also revealed regional and gender effects on the frequency of pitch accent types and phrasal-boundary tone combinations. Female talkers from both dialect regions demonstrated a preference for L*+H pitch accents and a dispreference for H* pitch accents relative to male talkers. This female preference for L*+H pitch accents is similar to Warren's (2005b) finding that New Zealand females produced later rise onsets than New Zealand males, and may reflect gender differences in phonetic implementation of the same phonological category in terms of peak alignment. Alternatively, these effects of gender on pitch accent preference may reflect frequency-based differences across genders in matching pitch accent inventories. Male and female talkers may have the same phonological categories that are realized in the same way phonetically, but they may produce the tone categories with different relative type frequencies. Additional research is therefore needed to determine if the observed gender effect is due to differences in phonetic implementation or frequency of use of pitch accent categories.

No significant effects of dialect or gender were observed for the L+H* pitch accent. However, 7% of the total pitch accents produced in the stimulus materials were transcribed as L+H*, leading to the tentative conclusion that Midland and Southern speakers exhibit the three-way contrast between H*, L+H*, and L*+H pitch accents defined by MAE_ToBI. However, given that the contrast between H* and L+H* has been shown to differentiate regional varieties of American English (Arvaniti & Garding 2007), a phonological analysis of the pitch accent inventories of the Midland and Southern dialects of American English, including how native listeners perceive the pitch contours, is needed to confirm this interpretation of our results. In addition, an acoustic analysis of the alignment and scaling of the pitch accents is necessary to determine if the same categories are realized differently across the two dialects.

At the IP-medial intermediate phrase level, the Southern females showed a preference for H− phrase accents compared to the Midland females, suggesting a dialect difference in marking the connection between successive phrases among female talkers. In particular, the Southern female talkers were more likely than the Midland female talkers to explicitly link intermediate phrases within IPs using the H− phrase accent. In addition, at the phrasal-boundary tone combination level, female talkers of both dialects preferred the L−H% phrasal-boundary tone combination compared to the male talkers, suggesting a gender difference in marking the relationship between successive utterances. Specifically, the female takers were more likely to use L−H% phrasal-boundary tone combinations, which have been described as marking continuation between IPs (Pierrehumbert & Hirschberg, 1990), than the male talkers. These findings are comparable to the research on HRTs, which reveal both dialect and gender differences in frequency of occurrence (e.g., Barry 2007; Britain 1992; Guy et al. 1986; Warren 2005b). In the current study, however, both

intermediate phrase boundaries and intonational phrase boundaries were found to be differentially marked, whereas previous research on HRTs has typically focused on IP boundaries. Additional research is needed to explore the relationship between rising ip and rising IP boundaries within and across dialects of English.

Prosodic patterns were also significantly affected by the passages that were analyzed in this study. A preference for the L−L% phrasal-boundary tone combination was observed for the Rainbow passage relative to the Goldilocks passage, which favored H−L% phrasal-boundary tone combinations, particularly among Southern talkers. Southern talkers also produced relatively more L−H% phrasal-boundary tone combinations in the Rainbow passage than in the Goldilocks passage. A preference for H* pitch accents was also observed for the Goldilocks passage relative to the Rainbow passage, which favored L*+H pitch accents, particularly among female talkers. Southern talkers also produced relatively more L* pitch accents in the Rainbow passage than the Goldilocks passage. However, only 1% of the pitch accents produced in the stimulus materials were transcribed as L*, so this result should be interpreted with caution. These effects of passage on phrasal-boundary tone combination and pitch accent preference may reflect the difference in genre between the two passages (fairy tale vs. pseudo-scientific text), the difference in complexity of the passages (the Goldilocks passage includes lists and direct speech, whereas the Rainbow passage does not), or the talkers' familiarity with the Goldilocks story. Additional research is needed to explore the role of utterance-specific and discourse-level characteristics on the prosodic patterns produced in read speech, and its interaction with talker gender and dialect.

While the aim of the present study was to explore variation in prosodic patterns across dialects and gender through careful examination of f0 contours, future work should relate these findings to more detailed quantitative analyses of f0 contours, the phonological contrasts present in these dialects, and the meanings conveyed by the tunes for Midland and Southern talkers and listeners. For example, the preference of the female talkers to use late peak accents (L*+H) and rising (L−H%) phrasal-boundary tone combinations, as well as the tendency of Southern females to use more rising (H−) phrase accents may reflect female talkers' attitudes and emotion toward the utterance content (see Daly & Warren 2001; Warren & Daly 2000). On the other hand, these intonation patterns could be interpreted by listeners as uncertainty (Hirschberg & Ward, 1992; Ward & Hirschberg, 1985). More research is needed to address these issues with the hope of shedding light on the interaction between the expression of regional and gender identity through prosody and the perception of sociolinguistic categories.

5.0 Conclusions

Taken together, the results of the current study revealed significant effects of dialect, gender, and passage on prosodic patterns, including pause distribution and the f0 patterns associated with prominent syllables and phrase boundaries. These results are consistent with previous research on prosodic dialect variation in American and other world varieties of English. These findings are particularly promising given that Midland and Southern American English are not the most strongly differentiated dialects of English, due to their geographic proximity, their shared segmental properties such as back vowel fronting (Labov et al. 2006), and the proposal that the Midland dialect should be treated as a transition area between the North and the South rather than as a distinct dialect (Davis & Houck 1992). In addition, the use of read speech produced by young college students most likely reduced the overall level of variation that was observed, because both style and education are known to affect the production of dialect-specific variants (Labov 1972). Additional research is needed to extend this analysis to more regional and social varieties of American English and other speaking styles, such as interview or conversational speech, and to include other

prosodic patterns, such as rhythmic structure and the phonological inventory of boundary tones, phrase accents, and pitch accents.

Acknowledgments

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Notes

Appendix

Appendix:

Rainbow Passage (Fairbanks 1940)

When sunlight strikes the raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

Goldilocks Passage (Stockwell 2002)

Once upon a time there were three bears: a Daddy bear, a Mommy bear and a little baby bear. They lived in a cottage deep in the woods. One morning, Mommy bear had made some porridge for breakfast, but it was too hot to eat at once. “Let’s go for a walk while it cools down,” said Daddy bear. “What a good idea!” exclaimed Mommy bear, and, with their bear coats and bear shoes on, they all set off for a short walk in the woods. That morning a little girl called Goldilocks was also walking in the woods. She was picking flowers and had wandered deeper in among the trees than her parents allowed her to go. After a while of being completely lost, she came into a clearing and saw the pretty little cottage. “I wonder who lives there?” she thought to herself, and walked up to the door. When she knocked, there was no answer, so she pushed the door. It swung open, and she went in.

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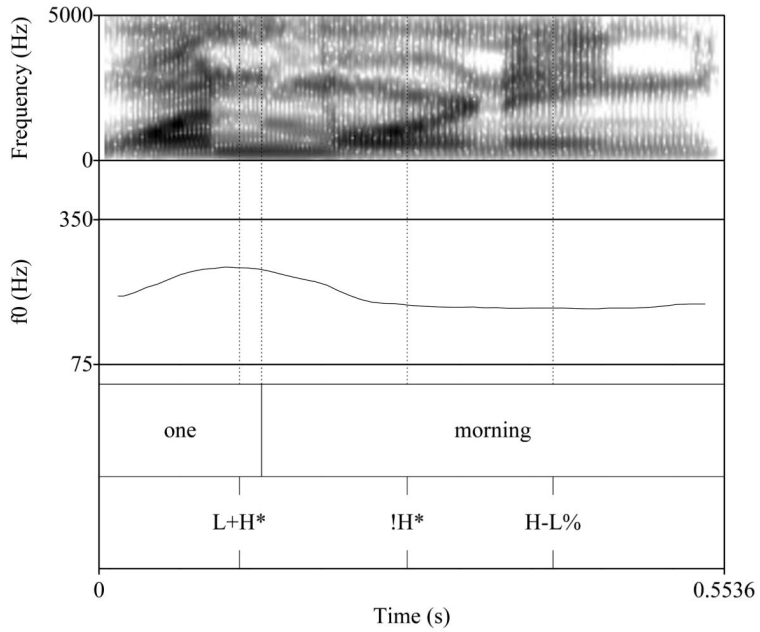

Figure 1.
Spectrogram and f0 track of the phrase “one morning” for a Midland female talker (mi0). Vertical lines indicate word boundaries and tonal targets.

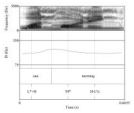

Figure 2.
Spectrogram and f0 track of the phrase “one morning” for a Midland female talker (mi6). Vertical lines indicate word boundaries and tonal targets.

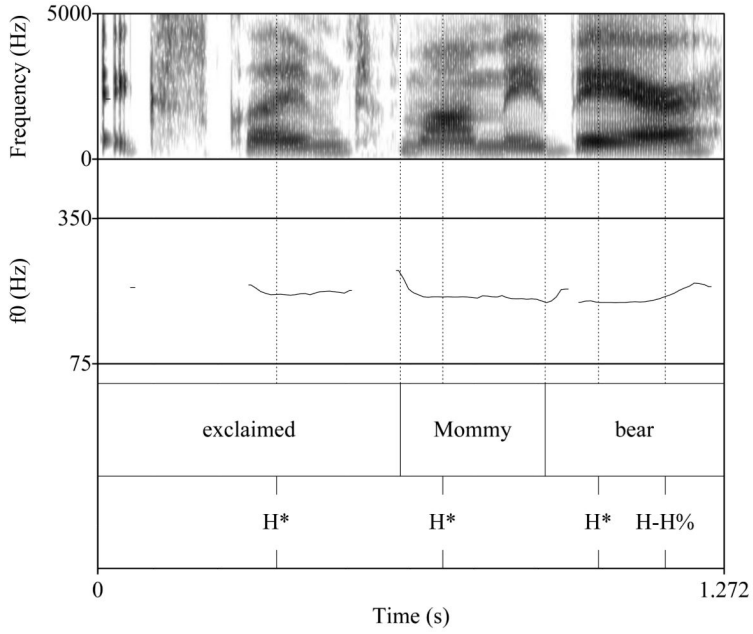

Figure 3.
Spectrogram and f0 track of the phrase “exclaimed Mommy bear” for a Midland female talker (mi7). Vertical lines indicate word boundaries and tonal targets.

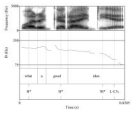

Figure 4.
Spectrogram and f0 track of the phrase “what a good idea” for a Midland female talker (mi7). Vertical lines indicate word boundaries and tonal targets.

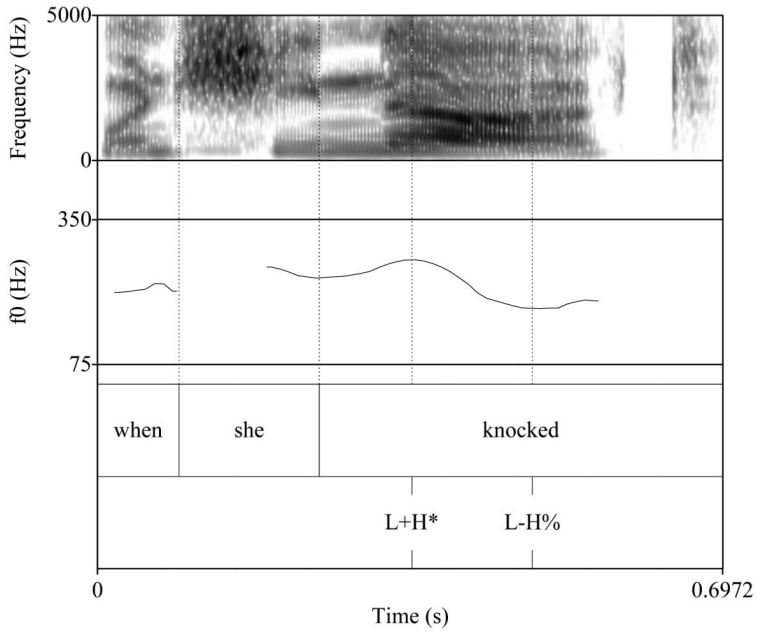

Figure 5.
Spectrogram and f0 track of the phrase “when she knocked” for a Midland female talker (mi0). Vertical lines indicate word boundaries and tonal targets.

Table 1

Mean speaking rate, mean pause duration, and mean number of pauses per IP for the male and female Midland and Southern talkers. Standard deviations are shown in parentheses.

	Midland		Southern	
	Male	**Female**	**Male**	**Female**
Speaking rate (syll/sec)	5.1 (0.8)	5.3 (0.3)	5.3 (0.3)	5.5 (0.3)
Mean pause duration (ms)	460 (73)	415 (32)	501 (63)	444 (63)
Pauses per IP	0.62 (0.14)	0.68 (0.10)	0.82 (0.10)	0.63 (0.09)

Table 2

Overall frequency of phrasal-boundary tone combinations (IPs), IP-medial phrase accents (ips), and pitch accents in the Goldilocks and Rainbow passages.

	Goldilocks	Rainbow
Number of phrasal-boundary tone combinations (IPs)	530	252
Number of IP-medial phrase accents (ips)	223	168
Number of pitch accents	1898	1016

Table 3

Significant main effects and interactions in the mixed-effects regression analysis of phrasal-boundary tone combination frequency. Proportions of target tone combinations are shown relative to all phrasal-boundary tone combinations produced for each relevant factor level.

Target Tone Combination	Factor	Proportion of Target	Tones
L−L%	passage	Goldilocks:	.62
		Rainbow:	.80
H−L%	passage × dialect	Southern Goldilocks:	.34
		Southern Rainbow:	.06
		Midland Goldilocks:	.28
		Midland Rainbow:	.20
L−H%	gender	Female:	.07
		Male:	.02
	passage × dialect	Southern Goldilocks:	.02
		Southern Rainbow:	.12
		Midland Goldilocks:	.05
		Midland Rainbow:	.03
H−H%	none		

Table 4

Significant main effects and interactions in the mixed-effects regression analysis of IP-medial phrase accent frequency. Proportions of target accents are shown relative to all IP-medial phrase accents produced for each relevant factor level.

Target Phrase Accent	Factor	Proportion of Target	Accents
L−	dialect	Midland:	.77
		Southern:	.65
	gender × dialect	Midland female:	.82
		Midland male:	.72
		Southern female:	.60
		Southern male:	.72

Table 5

Significant main effects and interactions in the mixed-effects regression analysis of pitch accent frequency. Proportions of target accents are shown relative to all pitch accents produced for each relevant factor level.

Target Pitch Accent	Factor	Proportion of Target	Accents
H*	passage	Goldilocks:	.83
		Rainbow:	.70
	gender	female:	.75
		male:	.82
L*+H	passage	Goldilocks:	.10
		Rainbow:	.19
	gender	female:	.18
		male:	.08
	passage × gender	female Goldilocks:	.13
		male Goldilocks:	.07
		female Rainbow:	.27
		male Rainbow:	.11
L+H*	none		
L*	passage × dialect	Southern Goldilocks:	< .01
		Southern Rainbow:	.04
		Midland Goldilocks:	.01
		Midland Rainbow:	.02