9th International Conference on Speech Prosody 2018
13-16 June 2018, Poznań, Poland

Rising Above the Standard: Variation in L+H* contour use across 5 varieties of American English

Rachel Steindel Burdin[1], *Nicole Holliday*[2], *Paul E. Reed*[3]

[1]Department of English, University of New Hampshire, USA
[2]Department of Linguistics and Cognitive Science, Pomona College, USA
[3]Department of Communicative Disorders, University of Alabama, USA

rachel.burdin@unh.edu, nicole.holliday@pomona.edu, pereed1@ua.edu

Abstract

This study examines the rate and quality of L+H* contours in five varieties of American English. Reading passage data from 30 female participants (10 Jewish English (JE), 10 African American English (AAE) and 10 Appalachian English (ApEng)) was coded using MAE-ToBI conventions. Mixed-effects modeling was used to compare the number of instances of L+H* and H*/!H* contours, and peak contour height, slope, and peak offset of the L+H* contours. ApEng speakers use the highest number of L+H* contours in their speech. JE speakers use fewer L+H* contours than ApEng speakers, but more than the AAE speakers. The phonetic implementation of the contour was also examined. ApE and JE speakers have higher peaks, wider rise spans, and steeper rises than AAE speakers, in parallel with the results for rate of use of L+H*. When compared to data for white speakers of Southern and Midland English (data from [1]), the three groups of interest all use a higher proportion of L+H* contours. These results represent an important theoretical contribution by demonstrating that suprasegmental features are ethnolinguistically and regionally conditioned by rate of use and different realizations, in a manner similar to what has been previously observed for segmental phonological features.

Index Terms: sociophonetics, intonational variation, prosody, Jewish English, African American Language, Appalachian English

1. Introduction

A growing body of work has been examining variation in rising pitch accents in English, including intra-linguistic variation in the phonetic implementation of those pitch accents [2-3] as well as differences in the relative rate of use of rising pitch accents compared to other pitch accents [1, 4]. Two recent studies [5-6] have looked at variation in both of these dimensions, comparing, respectively, Appalachian English (ApEng) with Southern English, and American Jewish English (JE) with co-territorial non-Jewish English. Another study, [7] examined differences in the use of rising pitch accents in African American English (AAE). All three of these studies were motivated by the fact that, despite the perceptual salience of intonational variation to lay listeners (particularly in ApEng, JE, and AAE), and apart from the aforementioned studies and ones like them, linguists have undertaken comparatively little systematic study of this variation in the United States using modern sociolinguistic frameworks. Likewise, formal approaches to intonation have often overlooked variation in both the use of different intonational contours and how they are produced (with the studies above, along with studies of non-question rises being a notable exception, see e.g., [8], *inter alia*), resulting in a serious gap in the linguistic knowledge about how speakers may employ intonational variation in both linguistic meaning as well as the construction and performance of their social identities.

Perhaps surprisingly, given the intuition that these three varieties are distinct from each other, [5-8] had similar results, with ApEng, JE, and AAE all using L+H* at more frequent rates than the comparison varieties, and for ApEng, and JE, with different phonetic realizations (for ApEng, earlier pitch accent offset, and for JE, higher peaks and larger rise spans). It is an open question, then, of how these varieties are different from not just local Standard varieties of English, but from each other.

The current study directly compares and contrasts rates and realizations of L+H* contour among JE speakers, AAE speakers, and ApEng speakers in read speech to better understand the ways in which ethnolinguistic varieties of English may have intonational systems with striking similarities and differences.

2. Methodology

2.1. Data Collection

The data set for this study consists of recordings of reading passage that were collected independently by each of the researchers between 2011 and 2016. The ApEng data were collected by Reed in Tennessee, the JE data were collected by Burdin in the New York City metropolitan area, and the AAE data by Holliday in New York City. The researchers were all members of the community being studied. For more details about both the definition of ApEng, JE, and AAE, and how participants were selected as being speakers of those varieties, see [5-7].

In each study, participants were recorded reading a passage as part of a larger sociolinguistic interview, which included other speech data and collection of survey data, including demographic data. To control for effects of gender, the current sample was limited to female participants, though analysis of other participants is planned for future research. In addition to the variation in ethnicity and location, there was variation in age across the groups, with the ApEng speakers having an average age of 50 (SD = 16.3); the JE speakers, 59.4

10.21437/SpeechProsody.2018-72

(SD = 1) and the AAE speakers, 19 (SD = 0.6). The speakers are also read different passages: the ApEng speakers read "Arthur The Rat", JE speakers read "Comma Gets a Cure", and AAE speakers read "The Rainbow Passage". The reading passages of interest were between 1-3 minutes long.

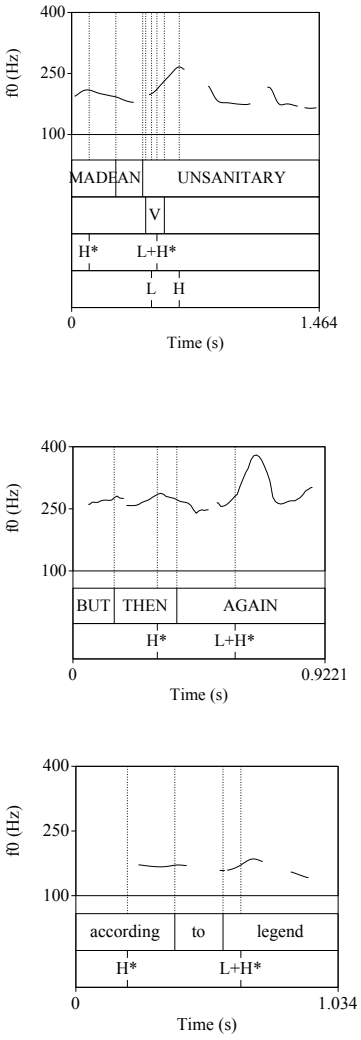
The results for the JE, AAE, and ApEng speakers were also compared to a subset (the female speakers) of the reading data described in [1]. Speakers in that study read both "The Rainbow Passage" and "Goldilocks". These speakers were all white, and came from two different dialect regions in the United States, the Midlands and the South. The map of hometowns of the speakers in the Nationwide Speech Project (NSP) Corpus (from which that data were drawn) did not include any in Appalachia, and although we cannot be certain that none of the participants were Jewish, due to the relatively low numbers of Jews in the Midwest and South, it is likely to be a much smaller percentage than in Burdin's corpus [9].

2.2. Coding

Reading passage data was obtained from 30 female (10 JE, 10 AAE, 10 ApEng) participants and data were coded using MAE-ToBI conventions [10] in Praat [11] by the author who collected the data. To check reliability, half of the files were double-blindly coded by another of the authors. The original coder compared the two annotations, and resolved any disputes for the final annotation of the files. An informal examination of the ToBI annotations for these sets of files revealed general agreement on the key variables of interest (H* vs. L+H*), and so the remaining files were only single coded.

The ToBI labels were then extracted from the TextGrids, and combined with the previously coded data from the NSP (annotated by the authors of that study). To allow for logistic models to be built, a binary distinctions was then made between (1) L+H* and non-L+H* accents, and (2) H*/!H* and non-L+H* accents.

For each L+H*, the following phonetic measurements were marked by the original coder, and then semi-automatically extracted using a Praat script: the f0 of peak of the rise (the highest f0 within the stressed syllable), the valley preceding the rise (the lowest f0 preceding the peak; in the case of non-sonorant onsets, the valley was taken from a preceding sonorant), the location of the peak, and the start and end of the vowel in the stressed syllable associated with the L+H*. From these measurements, we calculated (1) peak height, (2) rise span, (3) slope of the rise, and (4) peak offset. These measurements were also extracted from the Clopper and Smiljanic data. Finally, each L+H* was coded as being nuclear or non-nuclear. Panel 1 of Figure 1 shows an example L+H* from JE with the phonetic landmarks indicated; panel 2 shows an ApEng L+H*, and Panel 3, a L+H* from AAE; all three are shown adjacent to a H*. The phonetic differences between the JE and ApEng in L+H* are readily apparent in these figures.



2.3. Analysis

A number of different mixed-effects regression models were employed to observe patterns in the data set. Logistic mixed effects models were built to (1) examine the rate of use of the L+H* contour, and (2) the H*/!H* contours across the different groups of speakers. Linear mixed-effects regression models were built to test differences in (1) peak height, (2) rise span, (3) peak offset, and (4) slope of the L+H* contours across the three primary varieties of interest in the current study. In both cases, we also compare our results with data from the NSP Corpus to both contextualize them in the earlier research and provide comparisons with white varieties of English that may be considered somewhat closer to an idealized "Standard American English".

3. Results

3.1. Rate of use of L+H* and H*/!H*

Table 1 shows the overall difference in rate of use of contours between all five varieties.

Table 1: *Percentages for each pitch accent type across varieties*

Dataset	H*/!H*	L+H*	Other
AAE	74% (991/1339)	8% (108/1339)	18% (240/1339)
ApEng	63% (1652/2619)	21% (542/2619)	16% (425/2619)
JE	63% (963/1537)	12% (186/1537)	25% (338/1537)
Midland	76% (553/726)	6% (45/726)	18% (128/726)
Southern	74% (544/737)	5% (36/737)	21% (157/737)

Logistic mixed-effect models were built using the lme4 package [12] in R [13] to compare the use of L+H* vs. non-L+H* accents. The models included a fixed effect of variety (ApEng, JE, AAE, Southern, and Midland), and random intercepts by subject. Three models were built, with variety treatment coded, and the models were re-run with each of the three varieties of main interest (ApEng, JE, and AAE) as the reference level.

Turning first to the three varieties of interest, results indicate differences between them, with the ApEng speakers used significantly more L+H* contours than the JE speakers ($z = -2.958$, $p = 0.00309$) and AAE speakers ($z = -4.893$, $p < 0.001$). JE speakers used more L+H* than the AAE speakers ($z = -1.986$, $p = 0.04705$),

The ApEng speakers also used more L+H* than the Midlanders ($z = -4.858$, $p < 0.001$) and Southerners ($z = -5.477$, $p < 0.001$), as did the JE speakers (Midlanders, $z = -2.609$, $p = 0.009$; Southerners, $z = -3.272$, $p = 0.001$). The AAE speakers were not significantly different from the Midlanders or Southerners.

A similar procedure was done for H*/!H* vs. non-H*/!H* accents. ApEng speakers used fewer of these accents than the AAE speakers ($z = 2.842$, $p = 0.0044$), as did the JE English speakers ($z = 3.009$, $z = 0.00262$).

The ApEng speakers also used fewer H*/!H* accents than the Midlanders ($z = 2.756$, $p = 0.00584$), and the Southerners ($z = 0.224$, $p = 0.02918$); the JE speakers likewise used fewer than both these groups (Midlanders $z = 2.901$, $p = 0.00372$; Southerners $z = 2.333$, $p = 0.01967$). There were no significant differences between the AAE speakers and the Midlanders or Southerners.

However, differences did emerge between the AAE speakers and the Midlanders and Southerners when reading passage was controlled for by only looking at data from the "Rainbow" passage. In these passages, the AAE speakers used significantly more L+H* ($z = -2.263$, $p = 0.0236$) and fewer H*/!H* ($z = -2.129$, $p = 0.0332$) pitch accents than the Southerners. There was also a non-significant trend for the AAE speakers to use more L+H* pitch accents than the Midlanders ($z = -1.761$, $p = 0.0782$). When comparing "Comma Gets a Cure" and "Arthur to Rat" to the "Goldilocks" passage data only, the significant effects from above remained significant for the ApEng and JE speakers.

These results show differences between the three varieties in L+H* and H*/!H*, with the ApEng and JE speakers using more L+H* and fewer H*/!H* than the AAE speakers, and the ApEng speakers using more L+H* than the JE speakers. All three of the varieties also used more L+H* pitch accents, and fewer H*/!H* pitch accents then at least one of the two Standard groups (when controlling for passage to the extent possible).

Part of these differences between these three varieties may be due to the passage chosen, with past studies showing effects of passage choice on pitch accent used in read speech [1]. The passages read by the JE and ApEng speakers (both fictional stories involving animals) may lend themselves to more animated speech, and potentially, more L+H* accents than the passage read by the AAE speakers (a non-fiction passage); a follow up study using the same reading passage will be needed to control for these effects. However, it should be noted that C+S did not find differences in the use of L+H* accents between their two passages.

3.2. Differences in Contour Shape/Slope

Table 2 shows the averages, for each of the five varieties, for the peak height (Hz), rise span (Hz), peak offset (ms), and rise slope (Hz/ms).

Table 2: *Average of 4 f0 measures across varieties*

Dataset	Peak (Hz)	Rise (Hz)	Offset (ms)	Slope (Hz/ms)
AAE	224.16	35.46	5.24	2.24
ApEng	263.46	77.71	12.68	5.07
JE	275.29	75.49	12.52	5.05
Midland	264.11	44.84	6.75	4.27
Southern	230.81	28.78	10.23	3.11

Linear mixed-effects models were built comparing (1) peak height, (2) rise span, (3) peak offset, and (4) peak slope. Initially, models were built with fixed effects for variety, whether or not the L+H* was nuclear, and an interaction between the two, and random slopes by nuclear/non-nuclear status by subject. As the nuclear/non-nuclear distinction was not found to be significant, it was removed from the model entirely. As above, treatment contrasts were used for variety, with the factors re-leveled so that each of the three varieties was the baseline level. Overall significance for the effect was determined using log-likelihood comparisons between the model with and without the effect. A cutoff of $t > |2|$ was used for determining significance for comparisons between the varieties.

Models were also built using both Hertz and ERB; however, for the most part (with one exception, noted below), the results were identical, so the results are reported in Hertz.

3.2.1 Results

The ApEng speakers have significantly higher peaks than the AAE speakers ($\beta = -35.2009$, $t = -2.485$), as did the Jewish English speakers ($\beta = -41.636$, $t = -2.917$).

The ApEng had larger rise spans than the AAE speakers (β = -39.109, t = -4.578), as did the Jewish English speakers (β = -35.932 t= -4.109).

The ApEng speakers also had larger rise spans than the Midlanders (β = -32.948, t = 2.970), and the Southerners (β = -45.604, t = -3.991) as did the JE speakers (for the Midlanders, β = -29.771, t = -2.646, and the Southerners, β = -42.426, t = -3.664).

The ApEng speakers had steeper rises than the AAE speakers (β = -2.6609, t = -4.183), as did the JE speakers (β = -2.4336, t = -3.7168).

The ApEng speakers also had steeper slopes then the Southerners (β = -1.7935, t = -2.139). For the JE speakers, there was a non-significant trend towards having higher slopes than the Southerners (β = -1.5662, t = -1.851). When the models were run using ERB, this difference was significant (β = -0.0809, t = -2.382); this was the only difference found between models with Hertz vs. ERB.

There were no significant differences in peak offset between the groups.

Table 3 summarizes the results for the variables of interest, with the varieties ranked along each parameter in order from greatest (either highest percentage, or highest numerical value) to least; a > indicates that the difference was significant.

Table 3: *Summary of significant differences*

Measure	Ranking
L+H*	ApEng > JE > AAE > Midland, Southern
H*/!H*	Midlands, AAE, Southern > ApEng, JE
Peak Height	JE, ApEng > AAE
Rise	ApEng, JE > AAE, Midland, Southern
Slope	ApEng, JE > Southern, AAE

In addition to the aforementioned differences in rate of use of the L+H* versus H*/!H* contours, we also observed substantial differences in the shape of the L+H* contours under observation, though these results pattern remarkably well alongside the ones observed for rate of use, as can be seen in table 3. ApEng and Jewish English use more L+H* than the other groups; those L+H*s have higher peaks, large rise-spans, and steeper slopes. However, there still are differences between ApEng and Jewish English, with the ApEng speakers using more L+H* contours.

4. Discussion

The fact that speakers from a number of different regional and ethnolinguistic groups pattern in an orderly manner with respect to rate of use of L+H* contour as well as contour shape/excursion is a surprising and unprecedented finding in sociophonetic intonational research. The vast majority of studies on intonation in American English have focused on describing the intonational system of "Standard American English", without much attention paid to the potential for variation across other American English varieties. To our knowledge, the current study is among the first to specifically focus on a comparative analysis of contour use and shape and to attempt to highlight these differences between non-Standard varieties by comparing rate of use and realizations of one specific intonational contour in American English. Importantly, these findings suggest that at least from a production perspective, the rate of use as well as specifics of the contour shape may differentiate non-SAE varieties from both SAE and from one another.

The rate of use finding presents an interesting parallel with differential rate of use findings for segmental features between different non-Standard varieties. For example, Becker (2014) found rates of non-rhoticity in NYC were ethnolinguistically conditioned, with Jewish and African American speakers using rates that were each distinct from the local mainstream and other ethnic groups. The differences in phonetic implementation of the same feature can find numerous parallels in studies of segmental variation in the United States

The finding that the L+H* contour may act as a regional and/or ethnolinguistic marker to differentiate speakers from SAE across a number of different varieties is novel, but perhaps not surprising given this previous work on segmental features, and will also inform future research on this type of ethnolinguistic/regional variation in intonational patterning. A number of open questions remain: Is it the case that a specific number of L+H* contours, or the usage of them with a specific slope helps to differentiate southern white from southern black speakers? Or JE speakers from ApEng speakers? Further research is necessary to address these question, but as this is a pattern that has been observed with a number of different segmental features, it is possible that similar principles may apply for intonational features as well. The current study thus represents an important theoretical contribution by demonstrating that suprasegmental features may be ethnolinguistically conditioned by rate of use and different realizations, in a manner similar to that previously described for segmental phonological features.

The current study also illustrates the necessity of remembering that MAE-ToBI was based on, and created for a particular, standard variety of American English. As such, researchers should use caution, and their own judgements when making use of that system for non-Standard varieties. For example, Pierrehumbert and Hirschberg [14] describe the L+H* as indicating "correction or contrast". Our results here either suggest that JE, AAE, and ApEng speakers are, e.g., producing more focus constructions, or have a slightly different means of prosodic focus marking than Standard varieties, with the connection between L+H* and focus perhaps being looser, meaning that the meanings outlined in earlier studies might not hold in the same way, or to the same degree (see also [7]). Similarly, the difference in phonetic implementation of L+H* in JE and ApEng compared to the other varieties may have implications for how the H*/L+H* distinction is perceived (see, e.g., the motivation behind [2]). This study thus underscores the importance of research into intonational variation for both sociolinguistics and formal studies of intonation.

5. Acknowledgements

The authors would like to thank their research participants, the audience at the 2018 LSA Annual Meeting in Salt Lake City for their helpful feedback, and Cynthia Clopper for her assistance with this project. The order of authorship is alphabetical.

6. References

[1] Clopper, Cynthia G., and Rajka Smiljanic. (2011). "Effects of Gender and Regional Dialect on Prosodic Patterns in American English." *Journal of Phonetics* 39 (2): 237–45.

[2] Arvaniti, A. & Garding, G. (2007). Dialectal variation in the rising accents of American English, *Laboratory Phonology* 9: 547-575. *New York: Mouton de Gruyter*.

[3] Ladd, D. Robert, Astrid Schepman, Laurence White, Louise May Quarmby, & Rebekah Stackhouse. (2009). "Structural and Dialectal Effects on Pitch Peak Alignment in Two Varieties of British English". *Journal of Phonetics*, *37*, 145–161.

[4] McLarty, Jason A.. (2011). "An Apparent Time Analysis of Intonation Using Ex-Slaves: Comparing Raleigh, North Carolina AAE and EAE Pitch Accent Types and Frequencies." M.A. Capstone, North Carolina State University.

[5] Reed, Paul E. (2016). "Sounding Appalachian: /aI/ Monophthongization, Rising Pitch Accents, and Rootedness". PhD Dissertation. University of South Carolina.

[6] Burdin, Rachel Steindel. (2016). "Variation in form and function in Jewish English intonation". PhD Dissertation. The Ohio State University

[7] Holliday, Nicole R. (2016)." Intonational variation, linguistic style, and the Black/Biracial Experience". Ph.D. Dissertation. New York University.

[8] Armstrong, M., Piccinini, P.E., and Ritchart, A. (2015). The phonetics and distribution of non-question rises in two varieties of American English. In The Scottish Consortium for ICPhS 2015 (Ed.), *Proceedings of the 18th International Congress of Phonetic Sciences*. Glasgow, UK: the University of Glasgow. Paper 927.

[9] Clopper, C. G., & Pisoni, D. B. (2006). The Nationwide Speech Project: A new corpus of American English dialects. *Speech Communication,*48:633-644.

[10] Beckman, Mary E., & Ayers Elam, Gayle. (1997). *Guidelines for ToBI labelling, version 3.0*.

[11] Boersma, Paul & Weenink, David (2017). Praat: doing phonetics by computer [Computer program]. Version 6.0.36. http://www.praat.org/

[12] Bates, Douglas, Mächler, Martin, Bolker, Ben, & Walker, Steve. (2015). Fitting Linear Mixed-Effects Models Using lme4. *Journal of Statistical Software*, *67*(1), 1–48. https://doi.org/10.18637/jss.v067.i01

[13] R Core Team (2013). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. http://www.R-project.org/.

[14] Pierrehumbert, J., & Hirschberg, J. B. (1990). The meaning of intonational contours in the interpretation of discourse. *Intentions in communication*, 271-311.