



INTRODUCTION

- Accentedness is subjectively how strong listeners perceive a foreign accent to be.
- Many studies had participants rate speech accentedness on a scale from 1 (heavily accented) to 9 (little to no accent), but often without any instructions regarding what constitutes an accent or how to use the scale.
- Hayes-Harb and Hacking (2015) had participants complete an exit survey asking what criteria they used in their accentedness judgements. In terms of acoustic characteristics, 23% of participants said prosodic features of speech (pitch, rhythm, etc.) informed their ratings; 15% of participants said that speaking rate informed their ratings (see also Munro et al., 2010; Winters & O'Brien 2013).
- But how *much* do prosodic features and speaking rate contribute to accentedness ratings? To answer this, we presented accented sentences that preserved pitch and speaking rate information or removed one of those properties. Changes in accentedness ratings across the original and manipulated materials may be attributable to the acoustic property that was altered, shedding light on how much that property inform perceived accentedness.

METHODS

Participants

- 30 undergraduate students who self-reported normal hearing. All were native English speakers and received course credit for their participation.

Stimuli

- 30 Korean-accented English sentences (28 different native Korean talkers) from the Wildcat Corpus (Van Engen et al., 2010). The same sentences were presented in three blocks:

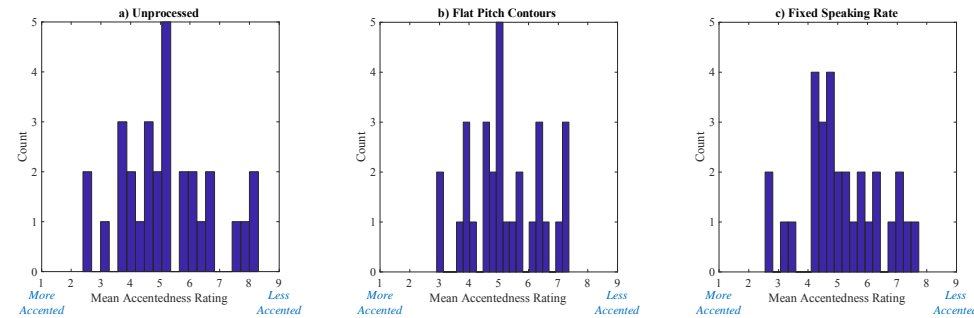
- Control Block:** No acoustic manipulations performed
- Pitch-Manipulated Block:** The average pitch was calculated for each sentence in Praat. The pitch contour was flattened and set to that mean pitch.
- Rate-Manipulated Block:** Speaking rate was calculated for each sentence in order to find the overall average (3.8 syllables/second). Using PSOLA in Praat, each sentence was scaled so that they all had the same speaking rate. To achieve this, some sentences were slowed down and others were sped up.

Procedure

- Similar to other studies, participants rated perceived accentedness of each sentence on a scale from 1 (heavily accented) to 9 (little to no accent).
- Sentences within each block were tested in random orders, and blocks were presented in counterbalanced orders.

RESULTS

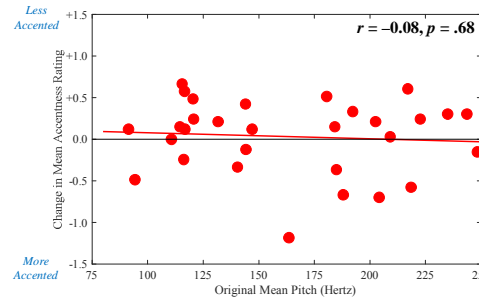
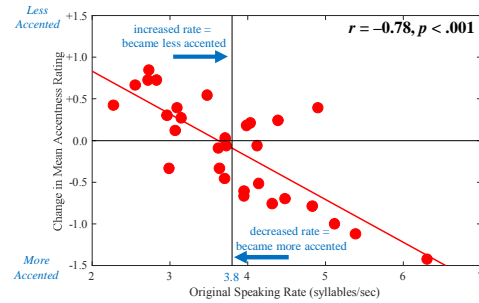
Global Analyses



- Mean accentedness rating was calculated for each sentence (averaged across participants); histograms are shown above
- Acoustic manipulations did not shift distributions of mean accentedness ratings rightward (toward higher numerical ratings / lower perceived accentedness). Responses were analyzed nonparametrically (raw data are ratings) and parametrically (comparing mean ratings):
 - Wilcoxon signed-rank tests: Flat Pitch Contours vs. Unprocessed: $Z = -0.75, p = .46$; Fixed Speaking Rate vs. Unprocessed: $Z = 0.65, p = .52$
 - Paired-samples t -tests: Flat Pitch Contours vs. Unprocessed: $t(29) = -0.41, p = .68$; Fixed Speaking Rate vs. Unprocessed: $t(29) = 0.85, p = .40$

Item Analyses

- Speaking rate manipulations did systematically vary accentedness ratings at the item level. At right are the original speaking rates for each (unprocessed) item, the global speaking rate (3.8 syllables / second), and the change in accentedness ratings (calculated as fixed speaking rate ratings minus unprocessed sentence ratings).
- Slower sentences whose rates were sped up (to meet the global rate of 3.8 syllables / second) were rated as less accented (positive rating change); faster sentences whose rates were slowed down were rated as more accented (negative rating change).
- Pitch contour manipulations did not systematically vary accentedness ratings at the item level. At right are the original mean f_0 values for each (unprocessed) item and the change in accentedness ratings (calculated as flat pitch contour ratings minus unprocessed sentence ratings).
- Changes in mean accentedness ratings were not correlated with sentence mean f_0 (shown at right) or standard deviation of sentence f_0 (as a proxy for degree of f_0 contour flattening; $r = -0.12, p = 0.52$).



DISCUSSION

- Here we tested a novel approach to remove or standardize one acoustic property of accented sentences at a time. Neither flattening pitch contours nor standardizing speaking rate led to overall shifts in accentedness ratings, but ratings varied systematically by item depending on whether speaking rate was increased or decreased.
- Pitch contours and speaking rates were manipulated in fundamentally different ways. For pitch contours, each sentence was treated individually and set to its own mean. For speaking rates, all sentences were all set to the global mean rate. Strong interpretations of which acoustic characteristics underlie perceived accentedness and to what degree they contribute should be mindful of these differences in approach.
- Pitch contour flattening did not yield significant results, perhaps in part because this manipulation made sentences sound unnatural and robotic. This manipulation could have affected sentence intelligibility and/or comprehensibility, which are not completely separable from accentedness (e.g., Munro & Derwing, 1995; Derwing & Munro, 1997).
- An additional challenge is that participants could have misinterpreted what accentedness is, as they were not given a set definition nor what properties make up accentedness. The criteria participants utilized to rate these sentences (pitch, speaking rate, or otherwise) are still unclear.
- Considerable variability exists between the 30 different sentences presented here. Future research should consider presenting different talkers speaking the same sentence, limiting this variability and increasing the likelihood of participants using the same / similar criteria to rate the accentedness of each sentence.
- Findings from this study offer a possible positive effect in terms of second language learning. Here, speeding up speaking rate resulted in sentences being perceived as less accented. When a non-native speaker is at a point in their second language learning where they are ready to have more native-like conversations, speaking more quickly could contribute to sounding less accented and, consequently, better understood.

REFERENCES

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