LANGUAGE ATTITUDES AND LISTENER-ORIENTED PROPERTIES IN NON-NATIVE SPEECH

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ABSTRACT

The study examines a number of acoustic properties of non-native speech directed to a native speaker, a non-native speaker with a shared first language background, and a non-native speaker with a different first language. Results demonstrate that the interlocutor condition interacts with the language attitudes factor: Participants with more positive attitudes towards their second language (English) differ along several acoustic dimensions from participants with more positive attitudes towards their first language (Mandarin), especially when interacting with native speakers of English. Expanded vowel space, higher articulation rate, and increased pitch adopted by English-oriented participants in interactions with native speakers of English may be indicative of their greater positive emotional involvement in the interaction.

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Keywords: non-native speech, language attitudes, listener-oriented, vowel space, rate of speech

1. INTRODUCTION

It has been known for some time that speakers can adjust the acoustic characteristics of their speech to accommodate the communicative needs of the listeners. The speaking style directed at increasing speech intelligibility, dubbed 'clear speech', has been shown to be adopted by *native speakers* in specific communicative settings, for example in the presence of noise or when addressing hearing-impaired listeners [11]. Clear speech is typically characterized by a decrease in the rate of speech, higher pitch and expanded pitch range, an increase in vowel duration, and expanded vowel space. Other populations of listeners who elicit similar adaptations in native speech include foreigners, infants and young children, and even pets [5], [12], [14].

Less is known about listener-oriented speaking style adaptations that may occur in *non-native* (L2) speech. Perceptual studies demonstrate that clear speech produced by proficient L2 speakers leads to intelligibility benefits comparable to those produced by native speakers' clear speech [13]. There is also some evidence that different pairings of native and non-native interlocutors may result in changes in speaking style, as assessed via the differences in resulting intelligibility and degree of phonetic convergence [7], [8], [13], [15]. These findings suggest that not only non-native speakers are able to modify their speech 'at will', they may do so in the absence of explicit instructions (e.g. to speak more clearly) but in spontaneous response to the change of listener and their perceived communicative needs.

The present study investigates the possible effects that the change of the interlocutor characteristics in terms of native language background may have on the acoustic properties of non-native speech. More specifically, we are testing the hypothesis that non-native speakers may choose to speak more 'clearly' to a particular group of listeners; those that the speakers expect to experience the greatest intelligibility-related difficulty with their accented speech. Listeners with whom the speakers don't share a common native language and those who have less exposure to non-native speech may belong to this category.

However, listener-oriented adaptations in non-native speech may also be modulated by speakers' L2 proficiency levels and attitudes towards their second language. In particular, participants with a more positive attitude to their second language and a greater motivation to be perceived as a proficient speaker by native listeners may choose to speak more clearly when addressing the native speakers of their L2.

We address these questions by examining the acoustic characteristics of non-native speech addressed to native and non-native listeners (those with the same and different L1 backgrounds) in light of speakers' language attitudes.

2. METHODS

2.1. Participants

Thirteen participants (5 women, 8 men) took part in the study to date. All were native speakers of Mandarin from the same dialectal area: Northern regions of mainland China (north of Yangtze River). Participants were recruited on the campus of a major Midwestern university and received payment for their participation. All participants completed a post-test questionnaire, adapted from [3] and [10], with

detailed questions concerning their proficiency in second language (English, self-rated), amount of first and second language use (in hours per week), quality of linguistic interactions (with native vs. non-native speakers of the language), and language attitudes (how much importance they attach to being perceived as a proficient/authentic speaker of their native vs. non-native language). Only language attitude results are discussed in this paper.

Three confederates (all women) served as the conversation partners in the experimental sessions. The first confederate was a native speaker of Mandarin (a non-native speaker with the same L1 background as the participants); the second confederate was a native speaker of the Midwestern dialect of American English (a native speaker of the participants' L2); the third confederate was a native speaker of Russian (a non-native speaker with a different L1 background). Both non-native confederates learned English as a second language in adolescence/adulthood and spoke noticeably accented English. The participants were also notified of the confederates' native language backgrounds during the introduction part prior to the experimental sessions. All confederates are authors on this paper.

2.2. Materials

Three different versions of the map, similar to those found in the HCRC Map Task Corpus [1], were created for the experiment. Each map contained the same 13 labeled landmarks, which were arranged in a different order and connected with a different route on each map. Both the participant and the confederate were given a copy of the same map per interaction, however the confederate's map did not have the route.

2.3. Procedure

After participants had given informed consent, they were instructed to complete the map task three times. For each task, participants were instructed to explain the route on their map to the task partner (one of the three confederates) such that the partner could replicate the route on their map. Participants were informed that their task partner does not have the route drawn on their map. Confederates were presented as fellow participants in order to allow for the most natural interaction possible and avoid any formality that may have been induced by speaking knowingly with an experimenter. During the map task, participants were seated across the table from the confederate, in the sound-attenuated booth. A custom divider did not allow the task partners to see each other's maps but did not interfere with visual contact. The order of interactions with three confederates was counterbalanced across participants. Each interaction lasted for about 10 minutes, the entire experiment lasting between 30 and 40 minutes. Both the participants' and confederates' voices were recorded digitally to separate channels.

2.4. Measurements

The participants' recordings were manually annotated for the syllable and stressed vowel boundaries in the target words (map landmarks). The values of the first two formant frequencies (F1 and F2) at midpoint of the vowel were collected. Formant values were examined for outliers and corrected manually where necessary.

Average pitch per syllable was also obtained using an autocorrelation pitch tracking algorithm. Outlying values due to pitch tracking errors were removed from the analysis. All the annotations and measurements were done in Praat [4].

Vowel space between the point vowels [i] [æ] [u] and [ɑ] was calculated by adding the areas of the two triangles, that between vowels [i] [æ] and [u] and that between [u] [æ] and [ɑ]. The areas of the triangles were found using the formula in (1), where *x* corresponds to the F1 value, *y* corresponds to the F2 value, and *A*, *B*, and *C* stand for the three point vowels.

(1)

$$A_{abc} = \left| \frac{Ax(By - Cy) + Bx(Cy - Ay) + (Cx(Ay - By)}{2} \right|$$

Articulation rate was calculated by dividing the number of syllables in each participant's response (estimated as a number of vocalic segments) by the participant's phonation time (total response time minus silence time).

Attitude ratio was calculated based on participants' responses to the Language Attitudes part of the questionnaire. Participants rated on the 6-point scale (0-strongly disagree, 6-strongly agree) statements such as "I identify with an English/Mandarin-speaking culture" and "I want others to think I am a native/proficient speaker of English/Mandarin". The totals of points in English-related statements and Mandarin-related statements were obtained and a Mandarin/English attitudes ratio (AR) was calculated. The ratio of 1 indicated that the participants valued the authenticity of their Mandarin and English-speaking identities equally. A ratio lower than 1 indicated a greater value of the English-speaking identity, while a ratio greater than 1 indicated a greater value of the Mandarin-speaking identity.

2.5. Analysis

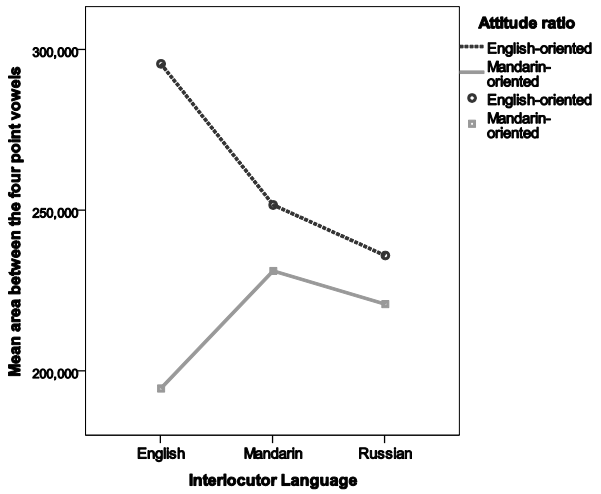
Participants were divided into two groups based on the attitudes ratio: Group 1 contained seven participants whose AR was higher than 1 (Mandarin-oriented); Group 2 contained six participants whose AR was 1 or lower (English-oriented). Acoustic parameters were checked for interactions of the AR grouping variable (English-oriented vs. Mandarin-oriented) with the interlocutor's native language variable (English, Mandarin, and Russian) in a series of repeated measures ANOVAs. Analyses with significant interactions were followed up by repeated measures ANOVAs within each AR group.

3. RESULTS

3.1. Vowel space

There was a significant interaction between the AR variable and the Interlocutor's Language (IL) in the analysis of vowel space: $F(2,22)=5.907$, $p<0.01$, which indicated that English-oriented and Mandarin-oriented groups demonstrated different vowel space patterns across the interlocutor conditions. Figure 1 shows that the two groups diverged in terms of vowel space in the native English-speaking condition.

Figure 1: Vowel space in English, Mandarin, and Russian Interlocutor Conditions for English-oriented and Mandarin-oriented groups.

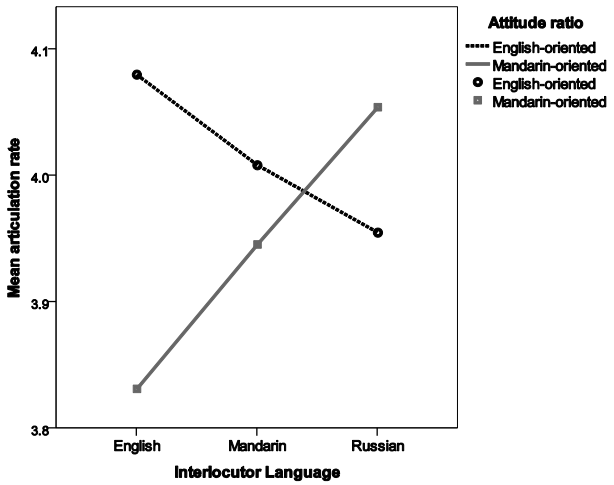


Follow-up within-group analyses showed a significant effect of IL within the English-oriented group: $F(2,10)=5.507$, $p<0.05$. In this group of participants, vowel space was more expanded when they were addressing a native English-speaking interlocutor compared to interactions with non-native listeners. Post hoc pairwise comparisons (Bonferroni) showed a strong trend for a significant difference in terms of vowel space between English and Russian conditions ($p=0.074$).

3.2. Articulation rate

There was a significant interaction between the AR factor and the IL factor in the analysis of articulation rate: $F(2,22)=5.631$, $p<0.05$. Figure 2 shows that participants in English-oriented and Mandarin-oriented groups used different articulation rates when addressing native English-speaking participants.

Figure 2: Articulation rate in English, Mandarin, and Russian Interlocutor Conditions for English-oriented and Mandarin-oriented groups.

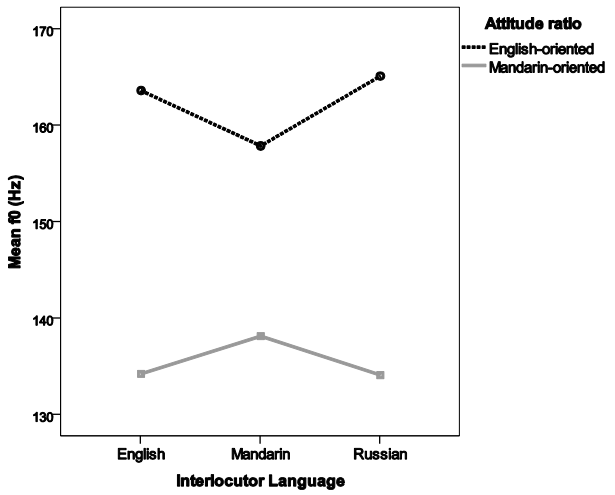


Within-group analyses demonstrated a significant effect of Interlocutor Language within the Mandarin-oriented group: $F(2,12)=4.001$, $p<0.05$. These participants spoke slower when addressing the native English-speaking interlocutor compared to interactions with non-native interlocutors. While the effect of Interlocutor Language did not reach significance within the English-oriented group, the quantitative tendency was opposite to that of the Mandarin-oriented group, similarly to the pattern of vowel space results.

3.3. Pitch

The analysis of mean *f*0 showed a significant interaction between the AR factor and the IL factor: $F(2,22)=5.512$, $p<0.05$. Figure 3 shows that English-oriented and Mandarin-oriented groups of participants adopted different mean levels of pitch across different interlocutor conditions. In particular, English-oriented participants spoke with a higher *f*0 when addressing English and Russian-speaking interlocutors, while Mandarin-oriented participants spoke with a higher *f*0 when addressing Mandarin participants.

Figure 3: Mean *f*0 in English, Mandarin, and Russian Interlocutor Conditions for English-oriented and Mandarin-oriented groups.



Within-group comparisons demonstrated a near-significant effect of Interlocutor Language within the English-oriented group: $F(2,10)=4.103$, $p=0.05$.

4. DISCUSSION

The results demonstrated that listener-oriented adaptation in the non-native speech of the participants were strongly influenced by their language attitudes. English-oriented and Mandarin-oriented groups of participants made difference acoustic adjustments in their speech across the three interlocutor conditions. Especially prominent is the quantitative tendency to treat the native English-speaking group differently from the two non-native groups. English-oriented speakers used a more hyperarticulated (expanded) vowel space when addressing native English listeners, while for Mandarin-oriented speakers the tendency was in the opposite direction. This finding is consistent with the prediction that non-native speakers who value their L2 identity and strive to be perceived as authentic/proficient L2 speakers will choose to speak more clearly to native English speakers.

However, the articulation rate results are pointing in a different direction. In this analysis, English-oriented group of speakers spoke faster when addressing native English listeners, while Mandarin-oriented speakers spoke slower to native English speakers. Clear speech is typically characterized with a slower speech rate and it is difficult to reconcile this result with the clear speech pattern. However, it is plausible that rate of speech varies in English- and Mandarin-oriented groups across interlocutor condition as function of speakers' emotional involvement during the interaction. Research shows that rate of speech increases as speakers take a stronger stance in the conversation [6]. English-oriented speakers may be showing a greater degree of emotional involvement in the interactions with native speakers by increasing articulation rate.

Mean f0 results are also largely consistent with this interpretation: English-oriented speakers' speech was on average higher-pitched when addressing English and Russian listeners than the speech of Mandarin-oriented group, while Mandarin-oriented speakers adopted higher pitch when addressing Mandarin listeners. Higher pitch has also been shown to correlate with greater emotional engagement, stance taking, and positive affect in speech [2]. [9].

Thus, the present results demonstrate that groups of non-native speaker adopt different listener-oriented strategies depending on the value they attach to their first and second language. The findings are most consistent with the interpretation that speakers who value their L2 identity are more positively emotionally involved in the interactions with native speakers, which is manifested in hyperarticulated vowel space, faster articulation rate, and higher pitch. Speakers who value their L1 identities demonstrate nearly opposite acoustic patterns in interactions with native and non-native listeners.

These results expand our understanding of listener-oriented properties of non-native speech beyond the clear speech settings, where participants are explicitly instructed to modify their speech. They show an interaction of the listener characteristics (such as that of a potential 'judge' of speakers' authenticity) and speaker characteristics (such as attitudes to one's first and second language) in a more spontaneous conversational environment.

5. REFERENCES

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