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A Phonetic Study of Uzbek Learners' Acoustic Analysis of English Pronunciation Errors

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ABSTRACT

The acoustic characteristics of vowel sounds influenced by the Kipchak dialect are the main subject of this study, which investigates the pronunciation difficulties encountered by Uzbek English language learners. We examine how learners' pronunciation of particular words is impacted by the phonetic shift from /ɪ/ to /ɛ/ using PRAAT software. Significant acoustic differences are revealed by our research, which sheds light on how native dialects affect English pronunciation.

Keywords: Phonetic inquiry, vowel shifts, English vowels, Kipchak dialect, Uzbek learners, acoustic analysis, pronunciation problems, and language instruction

1. INTRODUCTION

Native phonetic patterns frequently have an impact on second-language learners' pronunciation problems. This study examines how Uzbek speakers' English pronunciation is impacted by the singharmonism phenomena, which is the change from /ɪ/ to /ɛ/ in the Kipchak dialect. Developing successful teaching tactics that cater to the unique needs of students from this background requires an understanding of these mistakes.

2. METHODS

2.1. *Participants*

Data was gathered from Uzbek learners, mostly those from areas where the Kipchak dialect is spoken. Groups of participants,

whose ages ranged from 11 to 17, were selected from two Surkhandarya educational institutions.

2.2. *Acoustic analysis tools*
PRAAT software was used for acoustic analysis, enabling accurate phonetic property measurement. Eight phrases that targeted troublesome sounds impacted by their home dialect (such as /ɪ/ and /ɛ/ vowels) were given to the students to read.

2.3. *Data collection*
Sentences like "His dog is very friendly" and "Six birds flew over the lake" were recorded by participants. The investigation focused on words that were likely to deviate from native norms in terms of vowel pronunciation, such as "his," "hit," and "six."

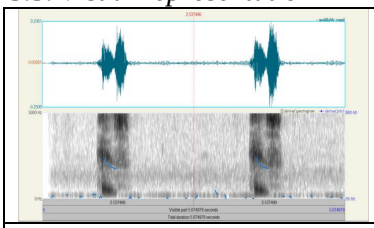
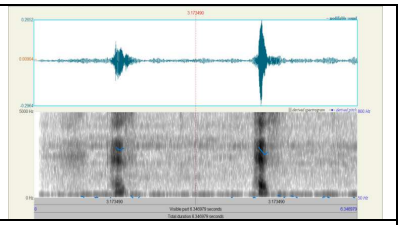
2.4. *Acoustic measurements*
Formant frequency (F1 and F2), which indicate the height and frontness of vowels, was one of the key metrics. To find variations brought on by dialectal effect, these parameters were examined between Uzbek learners and native English speakers.

3. RESULTS

3.1. *Formant analysis*
In words like "his" and "hit," Uzbek learners consistently pronounced the vowel /ɪ/ closer to /ɛ/. For example, Uzbek learners displayed greater F1 and lower F2 values, indicating a more open and center vowel position, while native speakers produced F1 values around 400 Hz and F2 values around 2000-2500 Hz for /ɪ/.

3.2. *Spectrogram comparisons*
Spectrograms showed that the learners' pronunciations differed from native speakers' in terms of the dispersion of acoustic energy. The /ɪ/ vowel in the word "six," for instance, was moved to /ɛ/, causing a discernible shift in the waveform and frequency ranges.

3.3. *Visual representation*

	
[hɪz]	[hɛz]

We must look at a number of factors, including waveform, spectrogram, and formant frequencies, in order to assess the acoustic characteristics of the word "his" as it is uttered by both native and non-native speakers.

3.3.1. *A comprehensive acoustic study of the native speaker's "his" word (left side)*

1. *Waveform analysis*

- Throughout the pronunciation, the waveform displays a steady and smooth amplitude.
- The /h/ sound represents the first energy explosion, followed by the vowel /ɪ/, which has a more continuous waveform, then the fricative /z/.

2. *Analysis of spectrograms*

- The low-energy area that appears as a voiceless glottal fricative is - /h/.
- Formant frequencies can be seen clearly:
  - A high vowel is indicated by the frequency F1, which is roughly 400–500 Hz.
  - A front vowel is indicated by the frequency F2, which is roughly 2000–2500 Hz.
  - /z/: Displays high-frequency energy at about 4000 Hz and voicing with discernible formants.

3.3.2. *Non-native speaker (right side)*

1. *Waveform analysis*

- The waveform exhibits some amplitude changes, which could be a sign of irregularities in articulation or stress.

- The vowel /ɪ/ may have a less smooth waveform, the fricative /z/ may have less intensity, and the initial burst for the /h/ sound may be less identifiable.

2. *Spectrogram analysis*

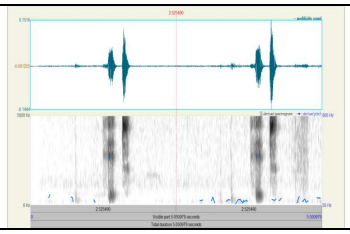
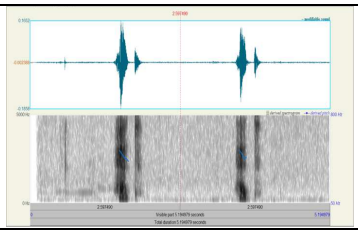
- /h/: Could be less distinct or exhibit more energy than the native speaker, suggesting an accent effect.
- The frequencies of the formant may be shifted:
  - F1: Could represent a varied tongue height and be a little higher or lower.
  - F2: May diverge, indicating a distinct, possibly more centralized tongue position.
  - /z/: Variations in high-frequency energy may cause voicing to be less noticeable.

3. *Comparison*

The native speaker's waveform has a steady, smooth amplitude. Changes in amplitude, suggesting possible variations in stress and articulation, are observed in non-native speakers.

4. *Spectrogram*

- /h/: - Native: A zone of clear low energy.
- Non-Native: Perhaps less distinct or with more vitality.
- The native frequencies are F1 at 400–500 Hz and F2 at 2000–2500 Hz.
- Non-Native: There may be a deviation between F1 and F2, signifying distinct tongue placements.
- /z/: - Native: High-frequency energy and clear voicing.
- Non-Native: Possible changes in high-frequency energy and less noticeable voice.

	
/hɪt/	/hɛd/

3.3.3. *Detailed acoustic analysis of the word "hit" native speaker (left side)*

1. *Waveform analysis*

The waveform displays a distinct burst for the final /t/ sound, a steady waveform for the vowel /ɪ/, and a clear initial burst of energy for the /h/ sound. This suggests a steady and fluid speech.

2. *Analysis of spectrograms*

- A voiceless glottal fricative, - /h/, appears as a low-energy area.
- /ɪ/: Visible formant frequencies
- A high vowel is indicated by the frequency F1, which is roughly 400–500 Hz.
- A front vowel is indicated by the frequency F2, which is roughly 2000–2500 Hz.
- /t/: A brief, high-energy region characteristic of a voiceless alveolar plosive is visible in the final burst.

3.3.4. *Non-native speaker (right side)*

1. *Waveform analysis*

- The waveform may exhibit amplitude changes, suggesting possible irregularities in articulation or stress.
- There may be less energy in the end burst for the /t/ sound, a less smooth waveform for the vowel /ɪ/, and a less prominent initial burst for the /h/ sound.

2. *Spectrogram analysis*

- /h/: Could be less distinct or exhibit more energy than the native speaker, suggesting an accent effect.
- The frequencies of the formant may be shifted:
  - F1: Could represent a varied tongue height and be a little higher or lower.
  - F2: May diverge, indicating a distinct, possibly more centralized tongue position.
  - /t/: The last burst may exhibit energy fluctuations or be less pronounced.

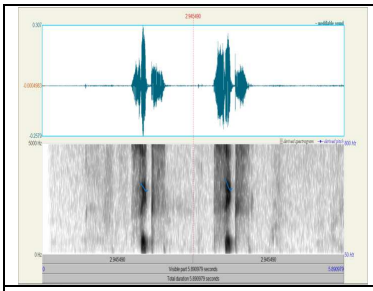
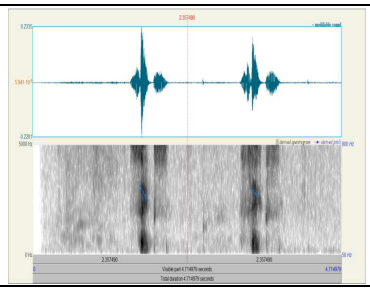
3. *Comparison waveform*

- Native Speaker: /h/ and /t/ have clear, steady amplitudes with noticeable bursts.

- Changes in amplitude, suggesting possible variations in stress and articulation, are observed in non-native speakers.

4. *Spectrogram*

- /h/: - Native: A zone of clear low energy.
- Non-Native: Perhaps less distinct or with more vitality. The native frequencies are F1 at 400–500 Hz and F2 at 2000–2500 Hz.
- Non-Native: There may be a deviation between F1 and F2, signifying distinct tongue placements.
- /t/: - Native: A distinct flash of strong intensity.
- Non-Native: Possible energy fluctuations, less pronounced burst.

	
/sɪks/	/sɛks/

3.3.5. *Detailed acoustic analysis of the word "six" native speaker (left side)*

1. *Waveform analysis*

- The waveform displays a distinct peak for the vowel /ɪ/ and the consonants /k/ and /s/ after a noticeable initial surge of energy for the /s/ sound.
- This suggests a steady and fluid speech.

2. *Spectrogram analysis*

- /s/: Shows up as a high-frequency energy zone, which is characteristic of a voiceless alveolar fricative.
- /ɪ/: Visible formant frequencies
- A high vowel is indicated by the frequency F1, which is roughly 400–500 Hz.

- A front vowel is indicated by the frequency F2, which is roughly 2000-2500 Hz.
- /k/: Displays the energy surge that characterizes a voiceless velar plosive.
- /s/: At the end of the word, high-frequency energy is displayed once more.

3.3.6. *Non-native speaker (right side)*

1. *Waveform analysis*

- The waveform may exhibit amplitude changes, suggesting possible irregularities in articulation or stress.
- The vowel /ɪ/, /k/, and final /s/ may exhibit variances in their peaks, and the first burst for the /s/ sound may be less prominent.

2. *Spectrogram analysis*

- /s/: Could be less distinct or exhibit more intensity than the native speaker, suggesting an accent effect.
- The frequencies of the formant may be shifted:
  - F1: Could represent a varied tongue height and be a little higher or lower.
  - F2: May diverge, indicating a distinct, possibly more centralized tongue position.
  - /k/: The burst may exhibit energy fluctuations or be less pronounced.
  - /s/: The high-frequency energy may show various patterns or be less noticeable.

3. *Comparison waveform*

- Native Speaker: /s/, /k/, and final /s/ have clear, steady amplitudes with noticeable bursts.
- Changes in amplitude, suggesting possible variations in stress and articulation, are observed in non-native speakers.

4. *Spectogram*

- /s/: - Native: High-frequency energy that is clear.
- Non-Native: Perhaps less distinct or with more vitality.
- The native frequencies are F1 at 400–500 Hz and F2 at 2000–2500 Hz.

- Non-Native: There may be a deviation between F1 and F2, signifying distinct tongue placements.
- /k/: - Native: A distinct energy surge.
- Non-native: Possible energy fluctuations, less pronounced burst.
- /s/: - Native: High-frequency energy that is clear. Non-native: The high-frequency energy is not as strong.

4. DISCUSSION

Phonetic Influence of the Kipchak Dialect: The findings demonstrate that Uzbek learners' pronunciation of English vowels is greatly impacted by the phonetic features of the Kipchak dialect, namely the change from /ɪ/ to /ɛ/. This lends credence to the idea that second-language phonology is significantly influenced by native dialects.

5. IMPLICATIONS FOR TEACHING LANGUAGES

According to the results, increasing awareness of vowel shifts and offering focused training to rectify these mistakes should be the main goals of pronunciation teaching for Uzbek speakers. A useful technique for locating and resolving certain problem areas is acoustic analysis.

6. CONCLUSION

This study emphasizes how crucial it is to comprehend how native dialects affect pronunciation in second languages. We can better understand the unique difficulties faced by Uzbek learners by examining the acoustic characteristics of vowel sounds. These results can guide the development of more efficient pronunciation instruction methods that are adapted to the requirements of students with comparable language backgrounds.

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