

Vowel discrimination of American English

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<https://doi.org/10.36505/ExLing-2023/14/0005/000599>

Abstract

This study is about vowel discrimination of eight New Mexico American English vowels by American and Greek native speakers. Two forced-choice discrimination experiments were carried out as follows. In the first experiment, native New Mexico American listeners were asked to choose between “same” or “different” among pairs of same or different New Mexico American English monophthong vowels. In the second experiment, likewise, native Greek listeners were asked to carry out the same task. The results of the investigation indicate the following: The New Mexico American listeners discriminated correctly for over 88% all vowels pairs except for the vowel pair /bɒt/~ /bɑ:t/ (bought~bot) which resulted in an 11% correct discrimination rate. The Greek listeners, on the other hand, discriminated all vowels well above chance including the /bɒt/~ /bɑ:t/ (bought~bot) pairs. The Greek results indicate a phonetic mode of discrimination rather than of phonological one.

Keywords: vowels, discrimination, phonetic distance, American English, Greek

Introduction

This study is about the discrimination of eight New Mexico American English (NMAE) vowels by native American and Greek native speakers. Three main questions are addressed: (1) are all eight monophthongal vowels discriminated equally? (2) is the phonetic distance among vowels reflected in vowel discrimination? (3) do Greeks listeners discriminate better the NMAE vowels which are closer to the acoustic structure of the Greek five vowels?

The pronunciation of vowels in the English-speaking world varies considerably and this is the case for different countries including the US. In addition to country and related dialectal variability, there is hardly any consensus about the number of vowels in American English or the respective transcription. Furthermore, the IPA (International Phonetic Alphabet) is not the standard phonetic transcription and different authors, and dictionaries use a variety of different phonetic-related symbols. In the present study, we use the Collins, Cambridge, and Oxford online dictionaries, which include both

American English and British English IPA transcription as well as the Merriam-Webster for American English.

Most of the phonetic studies in American English vowels include at least ten distinct monophthong vowels in a quasi-quadrilateral structure (e.g. Clopper, Pisoni, de Jong 2005) whereas, in Greek there is a general consensus about five distinctive vowels. i.e. /i, e, a, o, u/ in a quasi-triangular structure (e.g. Fourakis, Botinis, Katsaiti 1999, Lengeris 2016, Themistocleous 2017).

Methods and materials

In accordance with the aims of the study, speech data was acquired from NMAE native speakers with key words containing a set of eight vowels /i, ɪ, e, æ, u:, ʌ, ɔ, ɑ:/ in the carrier phrase “He said ___ slowly” (Table 1). All eight monophthong vowels are in meaningful lexical words. In addition to variable vowel quality indicated by different phonetic symbols, Mexico American English and American English and beyond in general are characterised by variable vowel quantity indicated by phonetic length mark (:).

Table 1. Key words with eight monophthongal vowels of New Mexico American English.

/bi:t/ (beat)	/bet/ (bet)	/bu:t/(boot)	/bɒt/ bought
/bit/ (bit)	/bæt/ (bat)	/bʌt/ (butt)	/bɑ:t/ (bot)

The speakers both spoke NMAE, one female and one male, in their thirties, who have grown up and were educated in New Mexico. They have no language disorders and speak what is considered standard NMAE. The speakers were instructed to produce the sentences in a clear and conversational way with no breaks within the test phrases. The experiment began with one test stimuli for each speaker which were not considered in the results.

The produced speech material by the two speakers was organized into a dual forced choice discrimination experiment regarding the eight NMAE vowels (Table 1). Each germane vowel was combined in pairs, i.e., “different” vowels, as well as with itself, i.e. “same” vowels, resulting thus in 36 stimuli pairs: 28 “different” pairs” and 8 “same” pairs. The 36 stimuli were organized in two repetitions of different vowels and four repetitions of same pairs totaling 88 for each speaker which makes 176 stimuli.

The experiment took place online at an individual pace and the experiment participants indicated either the “same” or “different” forced choice. Both New Mexico and Greek listeners were subjected to the same test material. Regarding the New Mexico listeners, there were 20 female and 4 male listeners. Regarding the Greek listeners, there were 7 females and 2 males. The mean time for the completion of the test was 29.70 minutes (SD 10.65 minutes) for the New Mexico listeners and 46.75 minutes (SD 22.8 minutes) for the Greek listeners.

Results

In accordance with the questions from the introduction and the methods we described, including the data, the results are as presented in the following tables (tables 1-2). In table 1, the American English discrimination data shows the following: all vowel pairs have a very high discrimination rate, i.e. over 88%, except for the /ɔ/~/ɑ:/ vowels in the “bought~bot” pair, which have an 11% correct discrimination rate. Table 2 shows the Greek listener data which forms three classes of discrimination rates: the first class is a discrimination rate above 73%, the second class is 61% and over and the last class is the “bought~bot” pair which has the lowest discrimination rate at 31%. The latter correct discrimination rate is higher than the NMAE one (11%), which is an interesting result *per se*.

Table 1. Correct discrimination rates of 4 male and 20 female Mexico American English listeners, a total of 24 listeners, for Mexico American English as a function of one male and one female Mexico American English speaker.

	beat	bit	bet	bat	boot	bought	bot	butt
beat	91%							
bit	93%	89%						
bet	90%	90%	91%					
bat	96%	94%	90%	90%				
boot	94%	99%	98%	95%	91%			
bought	99%	93%	96%	89%	94%	90%		
bot	99%	94%	98%	98%	94%	11%	88%	
butt	96%	95%	93%	91%	95%	99%	94%	91%

Table 2. Correct discrimination rates of 2 male and 7 female Greek listeners, a total of 9 listeners, for Mexico American English as a function of one male and one female Mexico American English speaker.

	beat	bit	bet	bat	boot	bought	bot	butt
beat	80%							
bit	81%	61%						
bet	100%	97%	83%					
bat	94%	97%	94%	77%				
boot	100%	97%	94%	94%	86%			
bought	91%	100%	88%	66%	97%	73%		
bot	94%	97%	88%	66%	97%	31%	67%	
butt	100%	97%	100%	75%	100%	84%	66%	91%

Discussion and conclusions

In accordance with the results of English, the NMAE vowels present a high rate of discrimination for all eight investigated vowels except for the vowels /ɔ/ and /ɑ:/ in the words “bought” and “bot”, respectively. This means that the distinction between these two vowels has been neutralised in this particular dialect of NMAE. This vowel neutralisation is fairly widespread in American English, especially in west dialects and predominately in younger generations and is usually referred to as the “low back merger” (Labov, Ash, Boberg 2006).

The results of Greek, on the other hand, show a different pattern. Some NMAE vowels have a higher discrimination rate and some others have a lower one. In general, the Greek listeners follow the Maximum Phonetic Distance Principle, according to which the bigger the phonetic distance the higher the discrimination rate. Thus, e.g. the high vowels have the highest correct discrimination rate when in pair with all other vowels except for the /i:/~/I/ (beat~bit) vowels. The latter distinction is not evident in Greek which lacks any long~short or tense~lax vowel distinction. On the other hand, the correct discrimination rate is much higher than the chance level for all vowels, which indicates that not only a phonology but also a phonetic mode of discrimination.

Thus, in accordance with the questions put in the introduction, (1) the vowels are hardly discriminated equally by either American English or Greek listeners, (2) phonetic distance is decisive in vowel discrimination for both American English and Greek listeners, and (3) the acoustic similarity between American English and Greek has hardly any discrimination effect on the discrimination of NMAE by Greek listeners.

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