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Ettien Koffi
St. Cloud State University, enkoffi@stcloudstate.edu

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THE DURATION OF [o] IN CENTRAL MINNESOTA ENGLISH: AN ACOUSTIC PHONETIC INVESTIGATION

ETTIEN KOFFI

ABSTRACT

In this paper, I investigate the durational characteristics of vowels produced by Central Minnesota speakers of English. The vowel [o] receives the lion's share of attention because it is stereotypically indexed with the Minnesotan way of speaking. Twenty-three female and 11 male talkers produced the 11 phonemic monophthong vowels of English contained in the words <heed, hid, hayed, head, had, hod, hawed, hoed, who'd and hud>. Eleven male talkers (64%) elongate their [o]s, while 10 female talkers (44%) do the same. Overall, the lengthening of [o] marks the speaker as having a stereotypical Minnesota accent, as portrayed in the movie Fargo and the sitcom Coach. The aggregated data suggests that female speakers are making a concerted effort to reduce the duration of their [o]s, but their male counterparts are less inclined to do so. The female linguistic behavior is probably due to the fact that the elongated [o] is perceived as less prestigious. This finding is consistent with sociolinguistic observations from numerous languages indicating that female talkers gravitate toward speech forms that they perceive as more prestigious.

1.0 Introduction

By way of introduction, let's consider two posts from my online *Introduction to Linguistics* course in Spring 2016. The posts are in response to online discussion questions dealing with sociolinguistic issues. When we get to the sociolinguistics chapter in Fromkin et al.'s *An Introduction to Language*, students usually have a lot to say about their own dialect of General American English (GAE) as well as other dialects. These two posts reflect the outsiders' view on the Minnesota dialect of GAE:

> I'm from New Orleans, so moving up to Minnesota, I learned that people had a language of their own, not necessarily a new language, but sayings that came about over and over. One is "ya knoow" or when *I hear some people with a deep MN accent, the word "no" sounds like "nooh". The "o" is pronounced very strongly*. [Italics added for emphasis]

> When I moved up here I remember the first thing my family noticed I picked up was the *"nooh"* version of "no." Which is ironic, because the Southern accent is notorious for adding extra syllables and stress to words, *yet for some reason this struck them as ridiculous*. [Italics added for emphasis].

The long Minnesota [o] is conspicuous to outsiders, more so than other dialectal features such [æ] and [e]-raising, the merger of [ɑ] and [ɔ], the lowering of the high lax vowels [ɪ] and [ʊ], and the raising of [e] over [ɪ], all of which are discussed in Koffi (2013), (2014), and (2016). Since [o] has a strong indexical value, most of this paper is devoted to it.

The paper is divided into three main sections. The first provides some background information about the participants and the research design and methodology. The second focuses on the acoustic correlate of duration of [o] in relation to the low vowel [ɑ]. Comparing the

duration of [o] with this vowel highlights a change in articulatory pattern that is underway in Central Minnesota English (CMNE). The third installment investigates gender-based durational correlates of CMNE vowels in general. The fourth and final portion prognosticates about the future of [o] in this dialect of English.

2.0 Participants, Data, and Measurements

This is the fourth paper in ongoing research on the acoustic characteristics of CMNE vowels. The first article (Koffi 2013) provides a general overview of the acoustic vowel space of CMNE. The second (Koffi 2014) examines whether or not there is evidence of the Northern Cities in CMNE. The third Koffi (2016), deals with the lowering of [ɪ] and [ʊ]. This fourth paper focuses on vowel duration, with a special emphasis on [o]. The data on which the analysis is based comes from the recording of the words <*heed, hid, hayed, head, had, hod, hawed, hoed, who'd, hud*> produced by 34 speakers who grew up in one of the nine countries of Central Minnesota. At the time of the recordings, the participants were college students at St. Cloud State University and ranged in age from 18 to 25. The recordings were made on personal computers using Praat, Version 6.0.15 at a sampling frequency of 44,100 Hz. Each word was repeated three times. Praat TextGrid was used to annotate each utterance as shown in Figure 1:

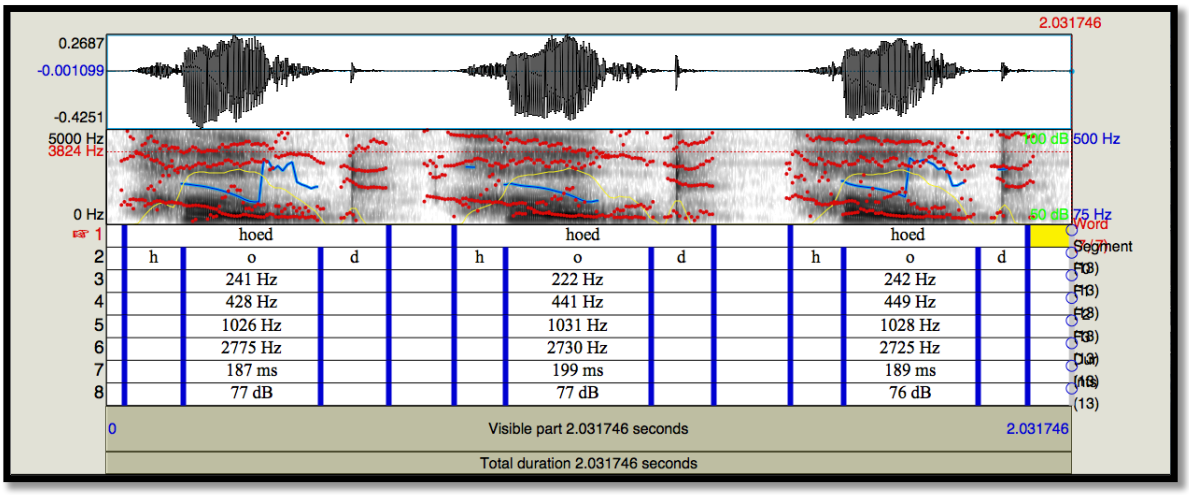

Figure 1: Sample Annotation

Each vowel was measured from onset to offset, that is, from the start of the steady state to right before the stop release, as shown above. Measurements were taken only of the vowel. The mean measurement of the three repetitions is reported as the representative duration of the vowel under consideration. The findings reported in this study are based on 1,122 tokens, that is, 11 vowels x 3 (repeated three times) x 34 (participants).[1] Since F1 and F2 data have been discussed in previous papers, only duration data by individual talkers are provided in Tables 1 and 2:

[1]The data on which the duration measurements are based was collected between 2013 and 2016. It is different from the data on which the previous papers were based. The F1 and F2 measurements mentioned in the present paper are based on the data collected between 2005 and 2012. The data collection was approved by the IRB. Participants signed Informed Consent forms.

Words	heed	hid	hayed	head	had	hod	hawed	hoed	hood	who'd	hud
Duration/Women	[i]	[ɪ]	[e]	[ɛ]	[æ]	[ɑ]	[ɔ]	[o]	[ʊ]	[u]	[ʌ]
Talker 1F	247	141	289	155	232	216	292	274	125	268	129
Talker 2F	224	146	278	149	247	222	212	234	173	240	155
Talker 3F	204	165	219	161	279	296	269	222	180	180	159
Talker 4F	177	165	167	134	188	191	207	175	125	142	126
Talker 5F	253	160	248	175	289	287	354	279	149	254	137
Talker 6F	270	186	266	192	250	241	252	280	205	235	209
Talker 7F	173	113	170	133	255	270	243	256	148	183	140
Talker 8F	252	159	326	169	321	310	304	284	146	230	155
Talker 9F	244	212	314	206	301	330	312	312	180	251	186
Talker 10F	253	210	303	185	309	251	299	296	192	260	154
Talker 11F	228	188	382	278	368	334	397	344	259	364	226
Talker 12F	324	225	503	266	323	297	363	262	262	287	244
Talker 13F	242	156	245	152	237	215	240	230	143	221	117
Talker 14F	249	185	329	186	279	278	317	310	176	239	181
Talker 15F	372	155	509	393	457	234	344	258	317	312	260
Talker 16F	295	259	277	229	316	306	273	347	274	231	254
Talker 17F	244	168	217	154	227	220	222	206	130	177	120
Talker 18F	273	233	298	243	303	321	318	328	232	311	226
Talker 19F	166	141	201	162	193	216	263	235	162	289	111
Talker 20F	238	174	210	169	184	224	251	192	185	148	126
Talker 21F	222	170	235	173	299	283	285	279	207	216	162
Talker 22F	238	182	238	184	271	266	285	266	219	243	187
Talker 23F	181	118	194	150	175	140	159	151	105	150	118
Mean	**242**	**174**	**279**	**191**	**274**	**258**	**280**	**261**	**186**	**236**	**168**
Standard Deviation	**47**	**35**	**89**	**58**	**64**	**49**	**55**	**51**	**54**	**56**	**47**

Table 1: Mean Duration Measurements for Female Talkers of CMNE

Words	heed	hid	hayed	head	had	hod	hawed	hoed	hood	who'd	hud
Duration/Men	[i]	[ɪ]	[e]	[ɛ]	[æ]	[ɑ]	[ɔ]	[o]	[ʊ]	[u]	[ʌ]
Talker 1M	204	113	217	121	207	215	253	226	178	178	112
Talker 2M	249	147	247	160	237	195	223	214	125	260	143
Talker 3M	203	144	233	149	215	219	225	213	168	225	144
Talker 4M	212	102	172	129	174	194	189	167	85	142	98
Talker 5M	260	169	241	172	238	237	221	230	161	232	176
Talker 6M	306	184	357	181	370	367	397	380	202	280	180
Talker 7M	364	246	286	162	292	233	255	294	172	275	177
Talker 8M	289	242	231	201	228	217	260	201	201	240	208
Talker 9M	181	127	187	110	187	176	204	207	103	181	107
Talker 10M	362	207	319	154	270	269	275	330	201	261	153
Talker 11M	208	262	237	191	212	216	252	259	254	240	256
Mean	**258**	**176**	**247**	**157**	**239**	**230**	**250**	**247**	**168**	**228**	**159**
Standard Deviation	**64**	**56**	**54**	**28**	**55**	**51**	**55**	**63**	**48**	**44**	**46**

Table 2: Mean Duration Measurements for Male Talkers of CMNE

3.0 The Duration of [o] in Relation to [ɑ]

There is a very large consensus in sociophonetic studies that in American English the low vowels [æ] and [ɑ] are longer than all other vowels. Lisker (1974:225-6) summarizes the relevant literature that has established a correlation between mouth aperture and vowel duration as follows:

> [That] vowel duration is related directly to degree of opening has been reported by many workers. … If open or low vowels involve more jaw movement than do closed vowels, then the greater so-called "intrinsic duration" of the former is a natural consequence provided we believe that in speech we regularly operate close to the limits set by physical constraints on the mechanism. … If we can take the frequency of the first formant as a reasonably good acoustic index of vowel opening, we can see just how closely duration and opening are related.

More recently, Fridland, Kendall, and Farrington (2014:344) have confirmed this correlation in their study of vowel duration within and across US dialects. They have also noted that because [æ]-raising occurs in areas where the Northern Cities Shift (NCS) is operating, [æ] is no longer a reliable test item. Koffi (2014:9-10) has presented evidence of [æ]-raising in CMNE before the voiced velar [g]. As a result, <brag> and <flag> are being pronounced respectively as [bɹɛg] and [flɛg] instead of [bɹæg] and [flæg]. For this reason, only the intrinsic duration of [ɑ] will be used to assess [o] lengthening in CMNE. We note in passing that, according to Klatt (1976:1209), the average duration of vowels in connected speech is 130 ms when they are stressed, and 70 ms when they are unstressed. Crystal and House (1982) and (1988) deal extensively with segmental durations in connected speech. A large body of experimental acoustic phonetic studies (i.e., Lehiste 1976:226, Philips et al. 1994:214, and Klatt 1976:1219), have shown that humans cannot perceive that one speech signal is longer than another unless their durational difference is ≥ 10 ms. This is known in acoustic phonetic jargon as the Just Noticeable Difference (JND) in duration.

4.0 Overall Vowel Duration in CMNE

The durational information in Tables 1 and 2 is summarized in Table 3 below:

Words	heed	hid	hayed	head	had	hod	hawed	hoed	hood	who'd	hud
Mean Duration	[i]	[ɪ]	[e]	[ɛ]	[æ]	[ɑ]	[ɔ]	[o]	[ʊ]	[u]	[ʌ]
CMNE Females	242	174	279	191	274	**258**	280	**261**	186	236	168
Mean Duration	[i]	[ɪ]	[e]	[ɛ]	[æ]	[ɑ]	[ɔ]	[o]	[ʊ]	[u]	[ʌ]
CMNE Males	258	176	247	157	239	**230**	250	**247**	168	228	159

Table 3: Vowel Duration of Low Vowels and [o]

The mean duration scores indicate that [o] is longer than [ɑ] in CMNE. The combined duration of [o] in male speech (247 ms) and female speech (261 ms) is 254 ms. The combined duration of [ɑ] in male speech (230 ms) and female speech (258 ms) is 244 ms. Overall, [o] is 10 ms longer than [ɑ] in the speech. Furthermore, 17 out of the 34 participants, exactly half of the participants, produced longer [o]s than [ɑ]s. In other words, one in two speakers from CMNE elongate their [o]s. Our data, therefore, validates the impressionistic observations that outsiders make about the long Minnesota [o].

4.1 The Duration of [o]: Focus on Male Speakers

Now, let's dissect the data to see if [o] lengthening correlates with gender. The durational difference between [o] (247 ms) and [ɑ] (230 ms) in male speech is 17 ms. According to Hirsh (1959:767), when the JND between two speech signals is ≥17 ms, people perceive the durational difference "correctly." In other words, when listening to male speech, male-accented [o]s are unmistakably longer than their [ɑ]s. This generalization notwithstanding, the data in Table 2

shows that while not all male participants lengthen their [o]s, 64% of them, that is, 7 out of 11 talkers, do.

4.2 The Duration of [o]: Focus on Female Speakers

The mean durational distance between [o] and [ɑ] in female speech is 3 ms. Since the duration is below the JND, we deduce that, generally speaking, the [o]s produced by female talkers are not longer than their [ɑ]s. However, this overgeneralization needs to be qualified, because it is based purely on averaging all the data. When we take a closer look, we see that 44%, that is, 10 out of 23 female talkers, also elongate their [o]s.

5.0 Miscellaneous Durational Correlates of CMNE Vowels

This section focuses on vowel duration other than [o]. The topics surveyed are the durational distance between tense and lax vowels, gender-based durational differences, and the observed duration distance between [ɑ] and [ɔ].

5.1 Durational Distance between Tense and Lax Vowels

Languages organize their acoustical vowel spaces so as to maximize intelligibility. At the very least, a JND in duration of 10 ms is needed between pairs of tense and lax vowels. Table 4 illustrates the durational distance between tense and lax vowels produced by male and female speakers in CMNE:

	Tense vs. Lax (Men)		Distance	Tense vs. Lax (Women)		Distance
1.	[i] 258	[ɪ] 176	82	[i] 242	[ɪ] 174	68
2.	[e] 247	[ɛ] 157	93	[e] 279	[ɛ] 191	88
3.	[æ] 239	[ɑ] 230	9	[æ] 274	[ɑ] 258	16
4.	[u] 228	[ʊ] 168	60	[u] 236	[ʊ] 186	50
5.	[o] 247	[ɔ] 250	3	[o] 261	[ɔ] 280	19
6.	[ɑ] 230	[ɔ] 250	20	[ɑ] 258	[ɔ] 280	22
7.	[ɑ] 230	[ʌ] 159	71	[ɑ] 258	[ʌ] 168	90

Table 4: Durational Distance between Tense and Lax Vowels

A few cursory observations are in order. First, tense vowels are longer than lax vowels in both male and female speech in CMNE. This is true in other dialects of GAE as well (Kent and Read 2002:108, 127). In CMNE (Koffi 2013:12-14) as in other dialects of American English, including Southern California English (Hagiawara (1997: 656), [ɑ] and [ɔ] have merged. Yet, our data shows that there is as much as 20 ms between them. This is not unexpected. The merger is limited in many instances to when [ɑ] and [ɔ] occur before obstruents and/or fricatives. When they occur before liquids, many speakers still produce them differently. This is evidence that an all-encompassing merger has not yet taken place. [2] This may explain why they have different durational behaviors (Fridland et al. 2014:345).

[2] Linguists are now unsure about the classification of [ɑ] and [ɔ] with regard to the phonetic feature [±tense] because of the great deal of variation in how GAE speakers produce them. In *A Course in Phonetics* (5th edition), Ladefoged (2006:97) classified [ɑ] as a tense vowel. In *A Course in Phonetics* (7th edition), Ladefoged and Johnson (2015:106) they do not include it among the vowels in Table 4, yet in the description that follows, they label it as a tense vowel. In *language Files (2007:56)*, it is classified as a lax vowel. Traditionally, [ɔ] has been classified as [+lax]. However, in Fromkin et al. (2014:208) it is listed among [+tense] vowels.

5.2 Gender-Based Durational Distances

It has been widely reported that males and females who speak the same dialect produce their vowels slightly differently. In general, females produce their vowels slightly longer than males. Data gleaned from Hillenbrand et al. (1995) and Holt et al. (2015) support this claim, as shown in Table 5:

Words	heed	hid	hayed	head	had	hod	hawed	hoed	hood	who'd	hud
Duration	[i]	[ɪ]	[e]	[ɛ]	[æ]	[ɑ]	[ɔ]	[o]	[ʊ]	[u]	[ʌ]
Hillenbrand Women	306	237	320	254	332	323	353	326	249	303	226
Hillenbrand Men	243	192	267	189	278	267	283	265	192	237	188
Difference	**63**	**45**	**53**	**65**	**54**	**56**	**70**	**61**	**57**	**66**	**38**
Holt Women	284	242	304	261	295	297	318	305	260	283	294
Holt Men	244	214	258	227	259	264	293	275[3]	221	245	272
Difference	**40**	**28**	**46**	**34**	**36**	**33**	**25**	**30**	**39**	**38**	**22**
CMNE Women	242	174	279	191	274	258	280	261	186	236	168
CMNE Men	258	176	247	157	239	230	250	247	168	228	159
Difference	**-16**	**-2**	**32**	**34**	**35**	**28**	**30**	**14**	**18**	**8**	**9**

Table 5: Gender Differences in Vowel Duration

Gender-based durational difference does not operate fully in CMNE. The vowels [ɪ, ʌ, u] are not differentiated by gender because the JNDs between male and female pronunciations are respectively less than 10 ms. These findings are in line with Clopper et al. (2005:1664) who did not find a significant correlation between vowel duration and gender among the participants in their study:

> The main effect of gender, the dialect X gender interaction, and the vowel X dialect X gender interaction were not significant. The significant main effect of vowel category merely confirms that American English vowels differ in their inherent length and no further analyses on that factor were conducted. The significant main effect of dialect suggests that some dialects have longer or shorter overall vowels than others.

However, because Clopper et al. failed to differentiate between specific vowels, their statement quoted above seems to contradict their other statement on page 1665:

> The vowel X gender interaction suggests that while there was no overall effect on vowel duration due to gender, the male and female talkers did produce significant duration differences for some of the vowels.

When vowels are considered individually, we see that females in CMNE produce seven vowels – [e], [ɛ], [æ], [ɑ], [ɔ], [o], and [ʊ] – longer than males. However, males produce [i] longer than females. Gender-based differentiation is inconclusive for [ɪ], [u], and [ʌ] because their JNDs are respectively less than 10 ms. It seems like a contradiction to say that females produce their [o]s longer than males here, even though it was stated in 3.0 that the latter elongate their [o]s more than the former. It is not a contradiction because the data in Table 5 deals with absolute measurements, whereas in 3.0, the duration of [o] was calculated in relation to [ɑ].

[3] Holt et al.'s data show that males' [o]s are longer than their [ɑ]s by 11 ms, barely above the JND in duration.

5.3 Prognosticating about the Future of [o] in CMNE

Predicting the future of a segment is fraught with risks because the prediction may fail to materialize. However, social dynamics are lining up right for a linguistic prediction to be attempted, albeit cautiously. According Ash (1982:143), the Minnesota [o] has attained the status of a "stereotype," that is, a feature that is "viewed by members of the speech community as non-standard. It is not the subject of strong feelings or conscious avoidance." Half of the participants in our study are not avoiding their long [o] even though they are aware of this feature in their speech. Yet, there are now both anecdotal and acoustic phonetic data to suggest that some CMNE talkers are trying to avoid the long [o]. I was suspicious when a former student of mine, a veteran of the Armed Forces, wanted to redo his acoustic phonetic project. Upon further investigation, he told me that when comparing the mean duration of his [o] to the one in Hillenbrand et al. (1995), he noticed that his [o] was still longer than the average Midwestern [o]. My daughter, who is now in high school, has told me that she and her cohort of friends are keenly aware of the long Minnesota [o] and do their very best to avoid it because they do not want to sound like people from Melrose, a small town in rural Central Minnesota. These two anecdotes indicate that some CMNE talkers are fully aware that [o] is a stigmatized pronunciation.

Hollywood has reinforced the stigmatization of [o] in the movie *Fargo* and in the sitcom *Coach*. Minnesotans and outsiders alike see the long [o] as quintessentially non-prestigious. As a result, this sound is undergoing change, especially in female speech. Many sociolinguistic studies (too many to cite here) contend that women tend to gravitate towards speech forms that are more prestigious. Suffice it to mention that Wardhaugh and Fuller (2015:215) call this kind of change *"change from above."* They explain the role that women play in "change from above" as follows:

> Change from above is sporadic, conscious, and involves issues of prestige, … As mentioned above, some observers believe that in societies such as ours, women may be in the vanguard of the first kind of change (i.e., change from above). … In this view, women are motivated to conform to, and cooperate with, those who are socially more powerful…"

Our data provides evidence of a "change from above" in female speech. Currently, 44% of female talkers in our study elongate their [o]s, while 56% shorten it. This is not so for male talkers who still overwhelmingly elongate their [o]s. Since the long Minnesota [o] is not a prestigious dialectal feature, it is not unreasonable to predict that younger generations of speakers will keep shortening it. Our data shows clearly that the trend has begun and younger women are at the forefront of this change in progress.

6.0 Summary

Minnesotans are acutely aware of the elongated [o] in their dialect, as attested by the three online quotes below. They are from the same online discussion board mentioned in the introduction:

> When I lived in Oregon (Orgen) several years ago, *I was made fun of* because I was told that I say *Minn-ee*[4]*-soo-tah.* I do not! The people that live in Oregon do not pronounce words the same as we do in Minnesota. People that live on the east coast do not pronounce their r's the same as we do in Minnesota. I was just talking to a relative that was telling me about her best friend and the way she talks with her eastern accent. She sometimes has to think or *even laugh at what* she says because of the different dialect. [Italics added for emphasis]
>
> While I was in Arizona over spring break my cousin and I ran into someone who was from Missouri while we were hiking in Phoenix. *Immediately* the lady could tell we were from the *Minnesota-Wisconsin* area because of the way we talked. It was weird to hear someone with a clearly defined Southern accent *tell us that we were the ones who had the accent. I've never really noticed or compared the way I talked to see if I sounded different. I always had the idea as a kid that Northerners had the normal way of talking* and the Southerners adopted a different way of talking. [Italics added for emphasis]
>
> My cousin in CA *always laughs* at me when *I say words with the long 'o', as it brings out my MN accent*. She and I spent hours when we were young comparing the pronunciation of words. I was just out to see her and had to tell her that my 4 yr old son pronounces <bag> as [bæg] and <flag> as [flæg] like a Californian, not as [bɛg] and [flɛg] like me- I assume he picked it up at school! [Italics added for emphasis]

The phrase *"laughs at"* occurs many times in online posts such as these ones. They all have to do with how Minnesotans pronounce [o]. Some Minnesotans, especially younger women, are keenly aware that their long [o] is stigmatized and they are trying to shorten it. If this trend continues, within a few generations, a eulogy will be written for the long Minnesota [o].

ABOUT THE AUTHOR

Ettien Koffi, Ph.D. in linguistics from Indiana University, teaches linguistics at Saint Cloud State University, MN. Author of many peer-reviewed articles on various topics in linguistics and of four books: *Language Society in Biblical Times* (1996), *Paradigm Shift in Language Planning and Policy: Game Theoretic Solutions* (2012), *Applied English Syntax* (2010, 2015), and the *New Testament in Anyi Morofu* (2017), a task which took over 25 years. Specializing in acoustic phonetics, dialect variation, and emergent orthographies, his current research centers on speech acoustics of L2 English (within the Speech Intelligibility Framework), Central Minnesota English, and Anyi. He can be reached at enkoffi@stcloudstate.edu

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[4] Koffi (2016:4) explains that [e] has risen above [ɪ] in CMNE. This affects its vowel quality. This is the reason why this speaker perceives it as a long vowel. Her intuition is correct, even though in this case, it has less to do with duration and more to do with a lower F1, which translates into [e] being higher than [ɪ].

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