UNIVERSITY OF CAPE COAST

A SOCIO-PHONETIC STUDY OF FOUR RECEIVED PRONUNCIATION (RP) VOWELS AMONG FANTE SPEAKERS OF ENGLISH IN GHANA

KOJO ODURO-OFORI

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BY

KOJO ODURO-OFORI

Thesis Submitted to the Department of English of the College of Humanities and Legal Studies, University of Cape Coast, in partial fulfillment of the requirements for the award of Master of Philosophy degree in English Language

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature……. Date……..

Name: Kojo Oduro-Ofori

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised under the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature……..….. Date……

Name: Professor Lawrence K. Owusu-Ansah

Co-supervisor's Signature……..… Date……..

Name: Dr. Isaac N. Mwinlaaru

ABSTRACT

The need for the codification of Ghanaian English has become increasingly more important than ever. In attesting to this need, this study sought to provide a sociophonetic description of vowels as articulated by Fante speakers of English in Ghana. More specifically, the study examines the pronunciation patterns of four vowels of English - the KIT /ɪ/, the FLEECE /iː/, the DRESS /e/ and the NURSE /ɜː/ among Fante speakers of English in Ghana, along the lines of gender and age. A total of 48 respondents (24 males and 24 females) were sampled for the study, using the quota sampling technique. A sociophonetic analysis conducted on the tape-recordings from the data showed that speakers fronted the vowels in KIT, DRESS, and NURSE, raised the vowel in KIT and NURSE, and demonstrated a consistent overlap of the vowels in DRESS and NURSE. Second, the analysis showed statistically-significant differences in the duration of the vowels among the old and young speakers. The older Fante speakers of English had shorter vowel lengths while the younger speakers had longer vowel lengths, a phenomenon that this study ascribes to history and age grading. Thirdly, the analysis found gender differences regarding the duration and articulation of the four vowels. This study makes significant contributions to Schneider's Dynamic Model of the Evolution of World Englishes, pedagogy, and scholarships on the codification of the English spoken in Ghana.

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DEDICATION

To my mother, Madam Elizabeth Amoah and my sisters, Afua Frimpomaa Ofori, Adwoa Afrakoma Ofori, and Akosua Nkansah Addo.

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CHAPTER ONE

INTRODUCTION

The English language has spread far beyond its "home" in Britain to almost every part of the globe. Currently, for instance, it is the main language of Australia and New Zealand TV broadcasting, the language in which Kenyan and Ghanaian politicians address their parliaments, the first language that is spoken at home by one-third of all Singaporean children (Schneider 2011), and the lingua franca with which semi-educated Ghanaians can ask directions anywhere in the country. The advent of colonialism spread the English language to several parts of the world. After colonialism, however, the English language gained strong roots in the countries in which it was transplanted. The language then became the means of communication for several administrative jurisdictions, eventually becoming the official language of communication in these countries.

There is another side of this expansion of the English language. In certain parts of the world, such as Tanzania and Malaysia, the language was imposed on the local people by foreign or colonial masters. Consequently, as it would likely be, most of these countries wanted to abolish the language after independence, since they regarded it as part of the colonization. "After all, it was a foreign tongue, alien to a substantial proportion of the indigenous population, and an unwelcome reminder and heritage of colonialism, which meant, among other things, foreign dominance and loss of political and cultural sovereignty" (Schneider, 2007, p. 20). Despite this intent, something extraordinary rather happened to the language. Over time, the language gained roots in regions where it was transplanted, not only managing to stay, not just

in formal or official functions, but grew and developed new forms and innovations.

The former situation mainly characterizes the use of English in Ghana. Although the language was not imposed on Ghanaians by the British, it has now become the language of official communication in the country. Its roles have become increasingly expansive and therefore it is prudent for intellectual probes into the growth, state and, usage of the English language in Ghana.

Background of the Fante

Ghana has a very heterogeneous linguistic landscape with over seventy (70) different local languages. English is, however, the official language in the country. Recently, pidgin English has gradually gained considerable roots as an unofficial lingua franca in the country (Adika, 2012; Huber, 2004; Obeng, 1997). Of the local languages, Akan is the most dominant, and it is spoken by over 43.7% of the total population (Ghana Statistical Survey [GSS], 2018). Akan falls under two broad categories, namely Twi, which is spoken in places such as Akuapem, Asante and Akyem, and Fante, which is spoken in areas along the coast from Sekondi-Takoradi to Accra (Bosiwah et al., 2015). Cape Coast, our area of focus, lies along the coast between Sekondi-Takoradi and Winneba. Cape Coast has a rich sociolinguistic history due to colonialism and the extended stay of the British in the city. Historically, Spencer (1971) states that the earliest recorded contact between the Europeans and Ghana (then Gold Coast) dates back to 1471 with the arrival of the Portuguese to Elmina (a neighbouring town of Cape Coast).

However, it was not until the late 16th Century that the British arrived in Kormantse (a few miles from Cape Coast) and by 1660 had seized the Cape Coast Castle from the Dutch (see Hakluyt, 1598; Odamtten, 1978; Spencer, 1971 for further details). Just like their predecessors, the English started schools in the castles to train the locals as translators and missionaries primarily. Cape Coast became, and it still is the heart for churches and early missionary schools. The first Anglican and Methodist churches were established in Cape Coast in 1775 and 1835, respectively. Subsequently, the missionaries took education out of the castles, and by so doing, the Methodist missionary opened the Wesley Girls High School and the Mfantsipim School in 1836 and 1876, respectively. The Anglican mission also established the Adisadel College in 1910, and the Catholic Church established the St. Augustine's College and the Holy Child Senior High School in 1930 and 1946, respectively. In 1962, a university college was opened in the city as well, making it the ultimate center of education in the country. Also, during the colonial period, Cape Coast was the capital city of the colony and the center for administration and governance in the Gold Coast. The merit of Cape Coast as a colonial capital meant that the English language was prominent in the city. Further, the influence of the British is still prevalent in the naming practices of the people of Cape Coast. Besides the ethnocultural names, one way of quickly identifying the people of Cape Coast and the Fante people, in general, is their naming practices. The majority of Fantes, especially Cape Coasters, have multiple English names because, to this day, they look back to their long encounter with the British and still identify with some of their practices.

Generally, the buildings, dressing, eating culture, tourism, and the cultural diversity of Cape Cast make the landscape intuitively British. Whenever Cape Coast is mentioned, one immediately associates transnationalism, mainly the British, with the town and its people. Consequently, Quarcoo (1994, p. 2) summarized Sey and Vangazig as,

> since the advent of colonialism, the hold of Fante on that city, although strong, has yielded some grounds to the Queen of Victoria of England and her grandchildren. For that reason, the Fanti language of Cape Coast has a reasonable amount of English lexical spicing in it.

Therefore, for one to study a bit of the history and the current trends in the development of the English language in Ghana, the people of Cape Coast serve as a great source of not just historical accuracy, but a hub for passionate usage and development of the language.

Statement of the Problem

From the days of Sey's (1973) work on Ghanaian English to the present day, several studies have been done on variation studies in Ghanaian English. Quite surprisingly, just a few of these studies focus on phonological variation. These studies, notwithstanding, have yielded several inconsistent results. Bobda (2000), for instance, says that Ghanaians realize only seven of the twelve pure vowels of the RP pronunciation. Huber (2004) also concludes that Ghanaians articulate seven out of the twelve. The findings of these scholars seem similar but they differ on the actual vowels which are produced by Ghanaian speakers. In addition to this, Huber (2004, 2008) asserts that Ghanaians do not articulate any of the long vowels in the English language.

To address some of these issues, Ankomah (2017) carried out an acoustic study of the entire vowel inventory of Ghanaian English. His work revealed that Ghanaians articulate all the 12 pure vowels of English, answering some of the inconsistencies in the earlier impressionistic studies. In addition to this study, Awoonor-Aziaku (2018) took a sociolinguistic approach to study the English spoken in Ghana by looking at three ethnic groups of the Ewe. Her work provided a much needed insight into the variations that could result from ethnolinguistic idiosyncrasies.

This study draws on these and other recent studies to study four RP vowels as realized by the Fante speakers of English in Ghana. Essentially, this study departs from Ankomah's work on the basis of its data target and concentration. Ankomah's (2017) study focused on all the 12 vowels and no particular ethnic group but this study specifically looks at the Fante speakers and the change and variation in the realization of the vowels through age and gender. In addition, although quite similar to Awoonor-Aziaku's (2018), this study dwells on a different ethnic group and different vowels.

Therefore, this study employs a scientific methodology to explore the differentiation in the phonology of Ghanaian English based on the different ethnic, social and contextual usage of English in Ghana. It is generally assumed that the English language in Ghana shows sociolinguistic differentiation and this study seeks to add to recent studies that document the extent and characteristics of these changes by looking at the four vowels as realized by the Fantes of Ghana.

Purpose of the Study

The main purpose of this study is to provide a scientific analysis of the vowels articulated by Fante speakers of English in Ghana. The study looks at how different gender and age groups of the Fante pronounce certain vowels. The findings of this study, together with other recent acoustic studies such as Ankomah (2017) and Awoonor-Aziaku (2018), will help in the creation of a scientifically backed description and codification of Ghanaian English.

Research Questions

The research will be guided by the following questions:

1. What are the acoustic characteristics of vowels of the males and females and the different age groups of Fante speakers of English in Ghana?
2. What are the statistical differences between the vowels articulated by the males and females and the different age groups of Fante speakers of English in Ghana?
3. What are the statistical differences in the vowel length of the Fante speakers of English in Ghana?

Significance of the Study

Most of the studies in this area (Bobda, 2000; Huber, 2004, 2008; Ngula, 2011) have been conducted using impressionistic means to analyze data, a practice that leaves room for questioning; with some new studies using acoustic methods to describe the vowel systems of Ghanaian English (Ankomah, 2017; Awoonor-Aziaku, 2018). This study, therefore, adds to the afore-mentioned acoustic studies to provide scientifically-backed analysis, which gives a more accurate analysis of the vowel system of Ghanaian English. For this reason, this study will be significant primarily in describing the quality and the duration of

the vowels of Fante speakers, which will add to the earlier studies on educated Ghanaian speakers and the Ewe speakers of English by Ankomah and Awoonor-Aziaku respectively. This will then supplement other efforts by scholars in this area towards the codification of Ghanaian English. Finally, this study has implications for a pedagogy of the Ghanaian English phonology and also provides a few comments and observations on Schneider's Dynamic Model of the Evolution of World Englishes theory.

Delimitation

In an ideal situation, the researcher needs to collect speech samples from every speaker of English from every Akan speaking community, in all aspects of language use, to examine every English linguistic variable as they relate to every individual. However, such an enterprise is clearly beyond the reach of the researcher due to unavailability of time and the complexity of data analysis. As such, the study is limited to four phonological variables: /ɪ/, /iː/, /e/, and /ɜː/, one speech style (sentence reading), and the age strata and gender as the underlying sociolinguistic variables.

The phonological variables were selected because I wanted to study the variation that may result from related sounds /ɪ/, and /iː/, on one side and /e/, and /ɜː/ on the other hand. These two sets of vowels are situated in a similar to close vowel spaces and it is interesting to see how Fantes distinguish between or overlap them in articulation. This choice in the long run also gives me the ability to study these vowels as regards their durations and to describe them scientifically in terms of length. Concerning the speech style, the sentence reading is adopted because that allows me to create different and unrelated contexts to divert the readers' attention from any particular recurrent sound

during data collection. Finally, the age stratum was selected for the study because I intended to find out how the several age groups realized the vowels and also to help give a historical insight to explain how the language has changed through time.

Organisation of the Study

Chapter one describes the background to the study, purpose of the study, research questions, statement of the problem and provides a background of the sociolinguistic context of Cape Coast. Chapter Two discusses the theories used in this study and reviews some empirical studies. In chapter three, the methodology is discussed. Chapter four is the first section of the analysis where the acoustic results are presented. Chapter five presents the other half of the analysis, which is the statitistical part. Chapter six presents the conclusion, recommendations and implications of the study.

Summary of Chapter

This chapter has provided a brief introduction to the field of study, the problem of the study, the purpose of the study, some research questions as well as the delimitation of the study. The following chapter will discuss the conceptual framework as well as some related literature on the study.

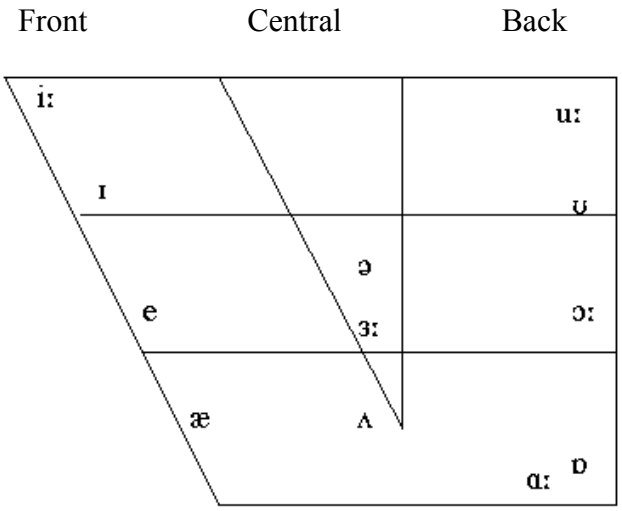
CHAPTER TWO

LITERATURE REVIEW

This chapter discusses the conceptual framework, the theoretical framework, and a review of some related literature of the study. The framework within which the study is situated as well as some literature on variation study, phonetics, and Ghanaian Englishes are reviewed.

English Vowels (Articulation and Auditory Perception)

Vowels are produced with the vocal tract open and for this reason; they are described as being articulated with open articulation. Likewise, they are produced with vibration of the vocal cords making all vowel sounds voiced sounds. The escape of the airflow coming from the lungs is always made through the mouth only because the soft palate is raised. This particular process means that all vowel sounds are oral sounds. Another issue that is of greater importance in talking about the articulation and description of the English vowels concerns the position of the articulators in the oral cavity. In this respect, the only possible articulation has to be the position of the tongue, being raised or lowered, and the frontness and backness of the tongue. Another point concerns the position of the lips, which in phonetics, is termed the rounding of the lips. A picture of the English Vowel Chart is provided below for a further description of the vowels



(Gut, 2009)

Figure 1: The English Vowel Chart

In the first four vowels, the highest point of the tongue is in the front of the mouth. These vowels are distributed in the vowel space almost equidistantly along the vertical tongue height plane. Consequently, these vowels are called the front vowels. The vowel /i:/ (as in sleep) is the vowel made with the highest tongue elevation – the tongue is usually closest to the roof of the mouth and accordingly, it is described as the high front vowel. The next vowel, /ɪ/ (as in sit) has the tongue in a slightly less close position. It is therefore classified as the mid-high front vowel. The vowel in *edge,* /e/ is produced with the tongue in a relatively lower position as compared to the earlier two and hence it is classified as the mid-low front vowel. The last vowel /æ/ in words like *apple* and *man* is not quite fully open and it is produced with the lowest elevation of the tongue. Consequently, they are referred to as the low front vowels.

The next vowel set to be discussed is the back vowels. They comprise /u:/, /ʊ/, /ɔ:/, /ɒ/ and they are produced with the back of the tongue raised towards the soft palate. The body of the tongue is in the highest position as regards the pronunciation of / u:/, which is therefore called a high back vowel. The next is the mid-high back vowel /ʊ/, which is somehow articulated with a

somewhat lowered tongue elevation. The vowel with the lowest tongue elevation is /ɒ/, and this is a fully open vowel sound. It is, therefore, a low-back unrounded vowel (Gut, 2009). Finally, the central vowels, /ə/, /ɜ:/, /ʌ/ are produced in an intermediate position between front and back vowels, with the body of the tongue raised towards the roof of the mouth in the area where the hard and soft palates come together.

Vowels can also be described based on the position of the lips during their production. Those that show movement and of the lips as well as the movement that occurs because of the lowering and raising of the jaw are called rounded vowels (Gut, 2009). Other vowels are just produced when the lips are simply spread, these are called unrounded vowels. In English, the mid and high back vowels are rounded (/u/, /ʊ/, /o/, /ɔ/) while the front and central vowels are unrounded ([I:], [ɪ], [e], [ɛ], [æ], [ɑ], [ʌ], [ə]).

The last issue to talk about here is the tenseness of the vowel. According to Cruttenden (2011), Tenseness describes the tension of the muscles of the vocal tract. With the production of tense vowels, the tongue is usually at an extreme height or backness. Tense vowels also occur freely at the ends of one-syllable words. The tense vowels in English include: / i:/, /e/, /æ/, (/u/, /ʊ/. Lax vowels, on the other hand, are produced when the tongue is not in an extreme position. They usually occur in one-syllable words only if they end in a consonant (Cruttenden, 2011). The lax vowels in English are: /ʌ/, /Ɵ:/3:/, /Ɵ/, and /ɪ/.

Although these classifications are very important in the classification of vowels, Ladefoged and Johnson (2011) raise some important weaknesses with this classification, of which I share. According to them, the vowels classified as

high do not have the same tongue height and again, the back vowels, especially vowel 11 and vowel 7 vary considerably in their measure and degree of backness. They also say that this classification does not provide adequate support for the considerable differences regarding the shape of the tongue in front vowels and back vowels. These weaknesses are a result of the auditory and perceptive ways of describing vowels and hence, the next section will present an acoustic analysis of vowels, which gives a better description of vowels.

Acoustic Description of Speech

After the production of speech, it is believed that this speech 'floats in the air' (Gut, 2009). It, therefore, becomes possible to study the remnants of the floating air. According to Gut (2009, p. 137), Acoustic Phonetics is "the study of the physical properties of speech and how they are perceived by listeners". In acoustic terms, the type of air pressure variation caused by the production of different speech sounds can differ in several peculiar ways, these same peculiarities can be seen in the sound waves they produce. When a sound is produced, it can be represented visibly in sound analysis software for further introspection and analysis. This physical representation of the sound, in the form of a graph, is what is known as the spectrograph. The spectrograph portrays the sound in the form of a wave which is regarded as the 'waveform'. This waveform is the direct representation of an uttered speech. It comprises several shades of thin lines with varying degrees of length and thickness. Due to the graphical nature of the spectrograph, two axes are manifest in its appearance: the vertical and the horizontal. On this graph, two acoustic properties are exhibited on the two axes: the duration and the intensity. The horizontal axis

shows the duration of the utterance. The duration of an utterance talks about the time of that particular utterance. Some utterances can be long but others can be very short. In light of this, the duration of utterance is measured in seconds (s) or milliseconds (ms). On the vertical axis of the graph, the air pressure behind the various sounds is indicated. This variation of the utterance pressure is referred to as loudness but primarily corresponds to the physical property of intensity. According to Gut (2009), intensity is a relative concept and as such, it is regularly calculated for some specific intensity level. The widely used unit of measurement for the intensity of sounds is the decibel (dB).

Another key acoustic property of sound is the frequency. Gut (2009) explains the frequency of a sound as the measure of the time each cycle takes place; that is, cycles per second. When a speech is produced and analyzed acoustically, one sees a regular pattern of climaxes and falls (peaks and valleys) evident in the air pressure. Each repetition of this up and down movement is known as a cycle and the frequency of an utterance is the time these cycles are produced. The frequency of a sound is usually measured in Hertz (Hz).

Conceptual Framework

Variationist Theory

This work is situated in the Variationist approach to language study. The variationist theory dwells on insights from several areas of intellectual research such as Linguistics, Sociology, and Sociolinguistics to help analyze the form and usage of the language as it occurs in its natural surroundings or contexts (Sankoff, 1982). The focus of this approach proposes that understanding a language goes hand in hand with understanding certain variables and some categorical processes. This means that the variation which is evident at the

several levels of language does not happen in a vacuum or by chance (Labov, 1966). That is, the variation in the utterances of people concerning their linguistic associations and choices are "systematically constrained by multiple linguistic and social factors that reflect the underlying grammatical systems that reflect and partially constitute the social organization of the communities to which users of the language belong" (Bayley, 2013, p. 2). Variation thus accounts for and accepts the diversity in expression and speech by people who constitute a specific space and then tries to scientifically investigate the speech behaviors of those people through ethnographic methods. This explains that variation is a human characteristic and that it is inherently part of human existence. Variationists also believe these changes may sometimes occur as a result of context or occasion since speakers may try to adjust or change their language to suit specific contexts. On this, Bloomfield (1933) says that speakers normally try to adapt and equate their speech-patterns to their other interlocutors in a given speech event. Kerswill (2011) affirms this when he puts forward that speakers do make changes in their speech-habits about pronunciation, grammar, and vocabulary in cases that depend on the relationship between the speaker and hearer, reasons for the speech as well as the circumstances that surround the production of the speech.

In trying to draw the variation between speakers, researchers in this field use speech samples on certain variables that are collected through personal observation. The task of identifying and analyzing variable forms is greatly aided by full transcription of data, except for the case of the study on phonological variations which requires a more detailed recording of data. (Llamas, as cited in Jalali, 2013). According to Poplack (2015), this exercise

helps the researcher to gain access to the vernacular, the relatively homogenous spontaneous speech reserved for intimate or casual situations.

Ultimately, variationists dwell on certain societal dynamics to serve as the blocks from which samples can be taken and studied. These dimensions include age, gender, ethnicity, network, social class, educational levels among others. These are social distinctions that are characteristic of every society and hence scholars try to dwell on either one or more of them to create a scope of the study.

Broadly, within variationist sociolinguistics, one may identify two general approaches: analysis as discovery technique and analysis as quantitative set of enquiry (Cameron, 2007). This field of research involves, then, the statistical study of speakers' choices. The two approaches are not mutually exclusive. Therefore, variationists recognize that achieving descriptive adequacy is a profound challenge. Moreover, the reliance on recorded speech, the incorporation of social factors into analysis, and the role of stochastic generalizations in theory building distinguish the field.

It is based on these systems and theories that this work analyses the selections made by Fante speakers of English in the acquisition, usage and change of the four vowels under study.

The Dynamic Model of the Evolution of World Englishes

One of the primary aims of this study was to assess the change the English language has gone through since it was transplanted in Ghana. In this regard, the Dynamic Model (Schneider, 2007) was used as a reference cycle in analyzing the data. Schneider (2003, 2007) proposes the Dynamic Model of the evolution of Post-Colonial English to account for and capture the wide range of

similarities that exist across different contact settings with different local particulars engaged with this contact situation. The central claim of this model is that identity constructions and realignments, and subsequent linguistic changes are at the heart of the development of post-colonial varieties of English (2007, pp. 38-30). This process of identity construction is viewed from two poles: the first describes the English settlers and the other talks about the indigenous people that experience contact with the settlers. This situation propels a phenomenon in the indigenous population which weakens ties of earlier associations with their countries of origin to increasingly stronger bonds with the country of colonial destination (Van Rooy, 2014).

Consequently, the Dynamic Model predicts that the evolutionary stages that a post-colonial variety takes depend on the identity of both the settlers (STL) as well as indigenous (IDG) strand. (Van Rooy, 2014). Subsequently, the model posits five successive stages, (Foundation, Exornomative Stabilisation, Nativisation, Endornomative Stabilisation, and Differentiation). This theory is used to supplement the analysis of the data and it is discussed in detail later in this chapter. In the following section, some studies which used the dynamic model is discussed.

Empirical Studies

This section will review some empirical studies which are related to the current work. The review will be categorized into three sub-divisions. These categories are language variation/Sociophonetics, some studies which used the Dynamic Model, and finally review of some existing studies on Ghanaian English.

Language Variation/Sociophonetics

This section of the chapter discusses some ground-breaking works on the area of language variation. Several scholars in this field of enquiry such as Labov (1963, 1972), Eckert (1999, 2000), Meyerhoff (2012), Anttila (2002) among other pioneering researchers believe and assert that language variation is part of human societies and that no human society can be studied without considering their language and that no language can be studied without encountering different variations in what they say and how they say them. According to Antilla (as cited in Howe, 2013), the field of sociolinguistics has as its traditional backing, the study of speakers' uses of phonological variants as a function of external social factors. Linguist often refers to Fischer's work (as cited in Labov, 1963, 1972; Trudgill, 1974; Wardhaugh, 2010) when they trace the earliest studies in language variation. The focus on Fischer was in understanding how the variable (ng) showed stylistic differences under varying levels of formality among young children in a New England speech community (Wardhaugh as cited in Howe, 2013). Several studies have established that the two variants [n] and [ŋ] are a stabilized variety and according to Wardhaugh (2010), [n] is usually the stigmatized from, which is normally produced in less formal contexts with the velar [ŋ] reserved for the more formal situations. Perhaps, it was not known at the time, or maybe attention was not paid, but the most significant finding which was to inform subsequent works was the observation that the [ŋ] reflected sensitivity to sex, formality, and cultural orientation toward school (Labov, 1972). Although this work did not mean to make any strong claims, the external factors (sex and formality) appeared to

characterize individuals' linguistic behaviour (Chambers, 2002; Labov, 1972; Trudgill, 1972; Wardhaugh; 2010).

This new finding influenced studies around this period and it is no surprise that in 1962, Labov studied and expanded the study of language variation by looking at the connection of sociolinguistic variables in two phases: stylistic differentiation and social stratification. In his study of the Social Stratification of English in New York, Labov (1966, 1972) was interested in observing the different use of post-vocalic [r] in the New York City (NYC) speech community. He carefully selected three department stores that exhibited distinct demarcations as regards the social groups to which he wanted.

The findings influenced several theoretical and methodological issues in sociolinguistic research. Most importantly, the study asserted that each subgroup of the NYC speech community exhibited different realizations of [r] similarly as the sociolinguistic variables (socioeconomic statuses) that naturally demarcated them (Howe, 2013; Labov, 1966). This means that members of the higher social classes realized the [r] more than those in the lower social classes.

The earlier work was replicated in 1972 in a more complex manner as he sought to juxtapose how linguistic variables combined with different speech styles and social class statuses in the Lower East Side of NYC speech community. Subsequently, five distinct social classes were identified, which demonstrated a uniform variation of five phonological variables in different contextual styles. When the variables were identified, a series of methods were employed to isolate five different contextual styles and these were investigated to ascertain the relationship between the dependent variables when they are

being realized in varying levels of formality. This was done from the most casual to the most careful types of speech (Labov as cited in Howe 2013).

The results of the study postulated that there was a consistent pattern of stylistic variation, where respondents showed consistent agreement in the [r] pronunciation in words like *car* and *bird,* which happened to be associated with prestige. It was also discovered that members in the lower middle classes realized the sound better than those in the upper-middle class concerning pronunciations in the more formal contexts (Labov, 1972). Labov then calls this act hypercorrection and puts forward that such a phenomenon is indicative of an acceleration of language change in the process.

Several scholars tried to replicate Labov's result in so many different urban communities during the sixties and seventies. These studies were not only done in North America and Great Britain (Macauley, 1977; Trudgill, 1974) but other places such as Panama (Cedergen, 1973) and Iran (Modaressi, 1978). All these studies showed a pattern of socioeconomic stratification of variables whereby the variants in the usage corresponded to the socioeconomic statuses of the respondents involved (Eckert, 2005).

At or around the same time that Labov conducted his 1972 NYC study, Trudgill (1974) was using the same methodological processes and relatively complex variables to study language variation regarding the varied social differences in British English. Building on Labov (1972), Trudgill (1974) investigated sixteen sociolinguistic variables as regards their relationship with formality and three other key variables (class, age, and gender). The study was conducted in Norwich, a city in England. Trudgill analyzed the variables (ng), (t), and (h) and his study revealed that the respondents who were in the higher

class in the strata realized and frequently used the sounds [ŋ], [t] and [h] variants in words like *singing, butter,* and *hammer* rather than the corresponding [n], [*?*], and Ø variants. He goes on to say that although members of the lower middle class say '*singin'*, they, however, do not say *'ammer'*. Again, members of the lower working class were purported to make use of both (ng) with the [ŋ] on the majority of occasions when they were not very careful of their speech (Trudgill 1974; Wardhaugh 2010). The analysis of Trudgill (1974) also elicited that the variations with the (ng) variable are not only related to social class but also gender, with females leaning more towards the use of (ŋ) than males, irrespective of their social classes.

In another related study, Shuy et al's. (1968) study in Detroit postulated similar results as the studies discussed above. The study looked at the use of negation among social classes in the state. The findings of the study asserted that the use of negation was closely linked with the social classes and statuses in the city and that the upper-middle-class members used double negation in about 2% of the data they analyzed. The following distribution is presented as follows: the lower middle class used 11%; the upper working class used 38%; the lower working class had the highest of 70% (Shuy et al., 1968). They, however, concluded that these usages are not just demarcated to each social class and that the changes are just not characteristic of them. They put forward that speech is inherently variable, just as societies are but that there are specific patterns that characterize these variations. The Detroit study also revealed that children use fewer standard linguistic characteristics than adults with similar backgrounds. The study also supported Trudgill's (1974) finding in the sense that males were found to use fewer standard forms than females.

The studies discussed above are not characterized in real-time – that is, the works did not focus on observed data for some time to ascertain the possible changes time has over them. However, for this work, I will discuss some studies that explored the impact of age on variation.

In the pioneering works of language variation, Labov (1972), though not very much discussed, looked at the differences in variation by the respective age groups in his data. His work originally informed that speakers in the 30-39 age group, out of the total data for his work, realized the post-vocalic [r] 15% of the time during a careful and formal speech. In the same vein, Fowler's (1986) work demonstrated a very similar finding. His replication of Labov's department store study pointed out that the [r] variable was prominently used by a high majority in the area and among all classes, styles, and age groups and that according to him, was a sign that change was in progress.

In 2009, Becker replicated Labov's (1972) study with the main aim of comparing how similar or varying the realization of the [r] variable has changed over time. He also studied individuals between the ages of 30-39 at the time of his work, which then correlates to a 40-year difference between the time the first study was conducted. His study recorded that more people used the post-vocalic [r] as compared to the time Labov conducted his (1972) survey. In essence, Becker (2009) found out that after 40 years of progression and change, the people in the age group, just as those in the earlier study, now realize the prestigious variant 26% of the time in formal speech, as compared to 15% during Labov's study. This change is not only in the prominent use of the [r] variable but also the adoption of the prestigious form in their formal contexts

(Howe, 2013). Becker (2009, p. 648) concludes that "age emerges as a strong predictor of *r* – pronunciation" in the region and respondents he studied."

A similar aim was shared by Trudgill (1983) when he decided to carry out a follow-up study on his initial (1974) work. During this time, the data he gathered included additional seventeen respondents to the original number he used for his pioneering work. His study revealed a systematic change concerning the difference in age production. In his initial study, he found out that the younger respondents between the ages of 10-25 used more of [θ] than [f] when pronouncing words like *thin.* However, the replicated study discovered that the respondents in the same group showed some progress which stressed that a change was in motion. For instance, the younger respondents substituted [f] for [θ] more frequently in words like *fin* and *thin,* thereby making it indistinguishable (Becker, 2009).

The next study to discuss is Chambers' (2012) work on the relationship between age and language variation. His work was a Canadian-based investigation that had the primary aim of exploring the decline in [hw]-pronunciations. He conducted a previous study on this same variable and the analysis of that same data revealed that the youngest age group in Canada experienced a change in the realization of the (wh) variable. The analysis asserted that these young ones were characterized by the elimination of the [hw] variant, while the older ones used the [hw] more often. His study also discovered a consistent change every 50 years among the middle-aged groups where they experience an increase in the [w] variant of the (wh) variable. This then correlates with the fact that younger people in any linguistic community are the creators, innovators, and propellers of change in language. On this, Chambers

(2002, p. 360) concludes that there is always proof that "there is an incremental increase in the use of a particular variant in the speech of younger people".

In her study of Australian English, Cox (2002) looked at the realization of vowels across the two sexes. The respondents for her study totaled 120, spread evenly (60 each) between males and females and, looked at vowels in the h*V*d context. In her findings and conclusions, she confirmed that the shapes and features of the speakers in her study were similar but what stood out was that females produced much higher formants than the males, a point which had been already established by other scholars in the field. Also, she found out that females generally pronounced longer vowels as compared to males. Her study had some flaws, as clearly pointed by Awoonor-Aziaku (2018) that the failure to adequately define the subjects and their social behaviours gives room for questions since the actual cause of the variation is not certain. That notwithstanding, the study serves as a good point of reference for this current study.

Noticing a gap, Awoonor-Aziaku (2018) conducted a study that looked at rather huge social factors which can adequately encompass and describe the vowel systems of Ewe speakers of English. Her study looked at the variation in the pronunciation of three RP vowels phonemes (the dress, nurse, and the letter vowels) among Ewe speakers of English in Ghana. Focusing on both individual and societal levels, she used three strong social indicators; age, gender, and education, which included dialect and social network to ascertain whether these propelled the possibility for variation in the realization of the vowels. Using a carefully selected word list as her instrument for data collection, she interviewed and recorded 96 speakers across two different dialect speakers of Ewe; Anlo

and Eweme. After careful normalization of the vowels, coupled with acoustic and statistical analysis, she came out with the finding that each of the vowels was first of all realized by her respondents. Besides, it was discovered that there were several variations of the respective vowel phonemes in the English of the Ewe speakers of the English language. Explicitly, she affirmed that the vowel /e/ has the variants [e], [ɪ], and [ɜː]. The nurse vowel [ɜː] was also found to have variations such as [eː], and [ɜː], while the letter vowel [ə] had variations as [ə], [e], [o], and [ʌ]. Of the different variants of the vowels, she found out that the choice for / ɜː/, and /e/ were dependent on the social factors such as age, gender, and social network. Although she agreed with the view that individual peculiarities can and accounted for changes in her work, she was of the view that the differences in the choices of the various variants of the vowels were high due to the social factors and the bracket the speakers found themselves in. A point which she raised and which I strongly believe is that the concept of social variations is evident but it should not be regarded as universal since each community and people have the tendency to exhibit variations on several fronts because, in as much as social factors are key, the ultimate tendency is the "attitude of the speaker and the phonological contexts of a segment can have a huge impact on the use of the variable" (Awoonor-Aziaku, 2018).

Her study is crucial in the socio-phonetic landscape of the English spoken in the Ghanaian contexts and her findings formed the backdrop of my passion and desire to replicate the study, on a smaller case within the Fante speakers of English in Ghana to explore whether there are any differences or even maybe whether her study can be seen to be existent in the several ethnic divisions in the country.

The discussions so far have pointed to the invaluable roles social factors play in the change and development of languages. Key among them, according to Chambers (2012) is the age factor and it is on this premise that this current study describes the state of the English spoken in Ghana, as related to how various age groups realize certain vowels in the country. I will now review some empirical studies which are rooted in Schneider's Dynamic Model.

Studies Involving the Dynamic Model

The first study that will be discussed in this section is the investigation conducted by Ugorji (2015) which looked at the development and status of Nigerian English in Schneider's Dynamic Model. His work sought to analyze and address the relationship between the formation and development of Nigerian English and the phases outlined in the model. Some studies on Nigerian English before his study (e.g., Bamgbose, 1995; Igboanusi, 2006; Jowitt, 1991; Udofot, 1997) were of the view that Nigerian English was at phase 3, which is the "Nativisation" stage in Schneider's Model and that although there are indications of some properties of the 4th and 5th stages, the properties are not enough and adequate "to merit any conclusive statement" (Igboanusi, 2006, p. 43).

He then goes on to say, based on the analysis of his data, that the sociolinguistic usage and the linguistic element present in Nigerian English, that there are indications and evidence for both the 4th and 5th stages and that these phases merge. He states that the merging of these phases does not happen in the linear order as stipulated by the Dynamic Model; instead, the linguistic differences between the two aforementioned phases may be unclear regarding the Nigerian experience.

As regards the requirement of specific elements of the Endonormative and Differentiation stages in the model, Ugorji (2015) outlines shreds of evidence by asserting that Nigerian English is owned by the natives, who tend to describe and refer to it as 'Our English'. He also mentions the growth of literary creativity and innovative expressions in literary scholarship with special emphasis on internationally acclaimed writers like Chinua Achebe and Wole Soyinka, whom he states won awards globally based on the literary writings using Nigerian English. On the issue of codification, he asserts that requirements for codification such as dictionaries appeared evidently, with reference made to the Nigerian Lexical Dictionary.

In his conclusions, he talks about the tenets and the shortfalls of the Dynamic Model, where he criticizes the theory for its rather linear order and robustness in describing contact-languages and post-colonial Englishes. He then opines that the theory can be modified to accommodate binary and reversals in the growth and development of post-colonial Englishes. He states that if the parameters outlined in the model are "binary-valued" then "Nigerian English appears to make it on every count" (p. 44).

These particular findings are very informative since the current study will also look to test the growth and development of the English spoken in Ghana based on the Dynamic Model to come up with claims which may be supportive or conflictive of some of the earlier findings based on works on the Dynamic Model

Owusu-Ansah, Sarfo-Adu and Ahiale's (2016) study on the unification of the classification of world Englishes discusses certain topics and themes which are very core and central to this current study. Their study looked at some

of the cemented theories of the classification of world Englishes with the primary aim of resolving the inadequacies and at the same time providing a thread of unity between them. Of interest to this study is the insight they gave on the Dynamic Model as well as the state and placement of Ghanaian English in the model.

They discussed some strengths and some weaknesses of the model before proceeding to talk about the state of Ghanaian English. On the strengths, Owusu-Ansah et al. (2016) lauded the ability of the Dynamic Model to merge both the native and non-native varieties into one framework. This particular act is very profound since it thinly distinguishes and hugely compares the ESL countries from some ENL countries such as New Zealand and Australia on the marks of history and politics. This is in the sense that most of the countries on the ENL classification were also recipients of colonization from the British some time past. Another strength that they outlined was the ability of the model to help track and mark the progress of a county within time and space as regards the growth and progress it makes in the English Language, an attribute which is not found in Kachru's Concentric Circles model. The model's failure to account for the Expanding Circle, as described by Kachru; the high regard that is given to the Inner Circle varieties as superior to the other varieties; and the lack of space for "proficiency levels" (Owusu-Ansah et al., 2016, p. 17) are regarded as some of the shortfalls of the Dynamic Model.

Placing Ghana in the Dynamic Model, Owusu-Ansah et al. (2016) assert that Ghana entered the first Phase somewhere in the 16th Century when the British first came to the Gold Coast. The advent of the first British on the Gold Coast was limited to trade and hence, there was only a limited form of contact

and interaction between the two parties, with middlemen serving as the link. Subsequent years saw the opening of schools to train the locals to speak the language. This continued to the 17th Century, where there were a considerable number of English speakers dispersed in the community (Sackey, as cited in Owusu-Ansah et al., 2016). Consequently, this period experienced huge lexical borrowings, and "very minimal nativization of English" (Owusu-Ansah et al., 2016).

The Exonormative stage began when the intent and drive on the Gold Coast shifted from trading activities to political governance, which also experienced a planned effort to promote the spread and usage of the English Language. Due to the advent of colonization and its attendant aims, the now colonial masters decided to extend their authority through the English language by spreading it to influence the factors stated above, we the aim of affecting the indigenes. This led to the establishment of schools and later, the formulation of educational policies that placed the English Language at the core of education in the country.

It is generally accepted among scholars that Ghana entered the Nativisation stage a long time ago. It is normally pegged right after the years after independence – 1957-1960. Characteristically, Ghana continued to look up to Britain for her norms and also as the official language in all spheres of formal and official outings in the country (Dakubu, 1997; Owusu-Ansah et al., 2016). There is also the presence of heavy lexical borrowing from the contact languages a considerable amount of innovations in the language, which is a strong indication of the third Phase.

Owusu-Ansah et al. (2016) continue by agreeing that the Endonormative Stage is not well evident in the country, although Owusu-Ansah (2012) says the language is gradually developing norms which are indicative of this stage. Despite this progress, Ghanaian English is yet to enter the fourth stage with three reasons outlined by Wiredu (2012) as being the basis for this assertion:

1. GhE cannot be said to be self-sufficient in terms of linguistic repertoire. GhE is heavily dependent on the standard varieties of British and American origin in the areas of lexis and syntax.
2. It has not yet established a well-recognized identity for its brand of English.
3. The use issue of standard GhE is still far from settled.

Adapted from Owusu-Ansah et al. (2016).

However, there are a few commendable efforts (such as Darko, 2003; Kirby, 1998) to codify and document the GhE variety but these are not enough and that more needs to be done to fully argue and fledge the growth of the language in the country.

Finally, although Ghana has not reached Phase 4 of the Dynamic Model, evidence suggests that Ghana enjoys some characteristics of Phase 5. Ghana's Non-Aligned Movement in the 1960s and her subsequent negotiations and dealings with countries such as the Soviet Union, Russia, and America, together with the growing interest in the American variety of English and her educational institutions, put her in the frame of experiencing a very weakened tie with her mother colonial country, Britain. Another evidence which is highlighted by Owusu-Ansah et al. (2016) is the issue of variability in the English spoken by Ghanaians in the country. These varieties exhibit several internal variations

which sometimes become difficult for total discernment by fellow countrymen and women. There is no wonder Boadi (as cited in Owusu-Ansah et al., 2016) stipulates two forms of Ghanaian English – educated and non-educated – which to him vary on a continuum.

In light of these assertions, it is no surprise that scholars tend to critique Schneider's Dynamic Model as being too linear with the primary reason for this assertion being that it does not accommodate situations such as the one discussed above.

Vowel System of Ghanaian English

Several studies have been conducted on a variety of English spoken by Ghanaians. Most of these studies were conducted after the pioneering work of Sey in 1973, which gave a primer classification apparatus for Ghanaian English. After that exploratory survey, many researchers conducted a series of studies on the grammar, semantics, and phonology of Ghanaian English. With this backdrop, and for this study, the focus will be placed on the phonetic and phonological aspects of these studies, especially on the vowel system of these studies.

After the influential seminal work of Sey in 1973, on classifying the distinct features of Ghanaian English, many scholars built on this platform to conduct varied studies (such as Adjaye, 2005; Ankomah, 2017; Bobda, 2000; Huber, 2004, 2008) on the features which are pertinent to this variety. In Sey's (1973) attempt to distinguish the phonological features of Ghanaian English, he went for the acrolectal speakers of the variety to serve as respondents for his source of data. He then described his work as evidence of educated Ghanaian English (E.G.E.).

In his analysis, he stated that the educated Ghanaian articulated vowels quite differently from the native speaker, a point which was to serve as the foundation to several arguments in the future. Sey (1973) affirmed that the educated Ghanaian, for instance, articulated the following RP vowels /**æ, a, ə**/ as /**a**/ and /**i:, ɪ**/ as /**i:**/. His work also came out with the finding that the educated Ghanaian speaker of English did not articulate the following 6 vowels, /æ, a:, ɪ, ʊ, ʌ ə/, a claim which was later contested, refuted and debated by several scholars. With this study being the beginning of detailed analysis of Ghanaian English, a lot of room was created for questioning but it is worthy to note that most of the claims in this work are still valid and regarded as one of the most cherished and insightful investigations into the nature of Ghanaian English.

However, as a student of scientific analysis of sounds, I will have concerns over the type of method for analysis which he used, a sentiment which is shared by other scholars such as Ngula (2011) and Ankomah (2017). The auditory analysis of vowels, especially vowels, gives room for doubt because most of the features are quite elusive when analyzing impressionistically (Roach, 1988). This notwithstanding, Sey's (1973) study serves as a starting point for me and other scholars in the study of Ghanaian English.

After this study, several studies have fronted the quest for the phonological classification of Ghanaian English. Most of these studies (e.g., Bodba, 2000; Huber, 2004, Lomotey, 2010) have portrayed similar aims and purposes: try to find the phonological description of Ghanaian English. For instance, Bobda (2000) sought to investigate the characteristics of vowels that are articulated in Ghana, in comparison with other African countries that happen to share a common colonial history. Huber (2004, 2008) also had the primary

aim of describing, impressionistically, the phonological features of the vowels and consonants of GhE. A similar aim was shared by Ofori, Dua, and Mintah (2014) and Adjaye (2005) who also aimed to create an inventory of all the sounds which can be classified as GhE. These studies, in addition to similar ones, confirm the need to classify and systemize the sounds of the Ghanaian English.

Where these scholars showed variation was in the respondents they used for their study. Bobda (2000), Adjaye (2005), Ngula (2011), Lomotey, (2010), and recently Ankomah (2017) all went for respondents who had at least a tertiary education because they were concerned about studying people who they regard as educated Ghanaian speakers of the language. Ofori, Dua and Minta (2014), on the other hand, studied students at the lower level of the educational structure in the country (the primary school level). Criticisms have been raised on this particular choice on the basis that the children are at the basilectal level of English proficiency and that their renditions will not be adequate for conclusions and generalization.

What these scholars refuse to acknowledge is that drawing conclusion based on "educated" speakers are not fully encompassing of the diverse base of people who speak English in Ghana. I say this for several reasons; first, English is not spoken by only educated people in the country, and hence, it will be wrong to make that claim that non-tertiary educated speakers are not suited enough for generalizations. Again, due to technological and sociological features of the modern-day, as well as the evolution and progress as elicited by Schneider (2007), it is gradually becoming a common practice to see young children having English as the first language. This makes it more interesting to study the

articulation of children so it is unmerited to discredit the phonological explorations of this variety because all of these come together to help clarify and understand the state of the language in the country. It is also for some of these reasons that this work seeks to merge all these varied angles, based on Schneider's (2007) model to describe the current state of the language as regards the several evolutionary stages GhE has gone through.

The findings of the studies are, however, crucial to the progress of analyzing and describing GhE because they provide meritorious points for scholars to reference and classify GhE.

However, the earlier works on this topic came out with some interesting findings. Bobda (2000), for instance, outlined that Ghanaians articulate the vowel sounds differently from the RP. He says that speakers of GhE articulate the RP vowel /ʌ/ as /**a**/ or /**o**/. He goes ahead to stress that certain central vowels such as /**ɜ:**/ are restructured to /**ɛ**/. He adds that the RP vowel /**ə**/ is articulated as /**a**/ or /**e**/. A claim which was later supported by other impressionistic studies such as Huber (2004) and Ofori, Dua and Minta (2014). Bobda (2000) then equated this variation in pronunciation to the long encounter Ghanaians had with the colonial Europeans. However, this point was vehemently refuted by Huber (2004), who stated that the variation is a result of the L1 of native Ghanaians.

Building on this, Huber (2004, 2008) conducted very detailed analysis of Ghanaian English. His work revealed that the 12 RP vowels were not adequately articulated by Ghanaians. He stresses that these vowels are reduced to just 7, which are **/I, ɛ, a, ɔ, u, e, o**/. His conclusion on the vowel system of GhE meant that Ghanaians did not articulate any long vowel. This point,

however, has been refuted by later scholars such as Ofori, Dua and Minta (2014) and Adjaye (2005).

The next two scholars to discuss here, Adjaye (2005) and Ofori, Dua and Minta (2014) have a very similar finding as regards their studies. Adjaye (2005) postulates that Ghanaians primarily articulate 8 pure vowels, /**ɪ ɛ a ɔ, i: a: u: ɔ:**/ instead of the 12 RP vowels. She states these are the average vowels in GhE although there are instances where the remaining vowels /**æ ʌ ɒ ʊ ə ɜ:**/, are evident in the speech of some Ghanaians. In a similar vein, Ofori, Dua and Minta (2014) pointed out that the vowels in GhE are reduced to 8 /**i, ɪ, ɛ, a, ɔ, u, e, o**/. This finding supports earlier studies by Bobda (2000) and Huber (2004) that Ghanaian English did not realize any long vowels. Later studies have refuted this claim, chief of them being the acoustic investigation conducted by Ankomah (2017).

Nothing can be taken away from the findings of some of these earlier works that have evolved from these earlier studies. However, one evident thing is the inconsistency surrounding the description of vowels in GhE. In my view, and one also shared by scholars such as Ankomah (2017), the inconsistencies are a result of the method of data analysis these scholars employed in their studies. Most of these previous studies use impressionistic analysis and as stated by Roach (1998), using auditory means to perceive vowels may lead researchers to miss out on vital information in their descriptions. This probably may result in the varied opinions shared by these excellent scholars.

Consequently, current phoneticians, such as Ankomah (2017) try to use more scientific approaches to analyze these vowels to help clarify, confirm, or refute some of these earlier claims. This scientific investigative approach

motivated me to conduct this work and in so doing, taking a different direction to the studies which have been discussed here.

One of the current works on the acoustic description and identification of Ghanaian English is the work by Ankomah (2017). As the title of his work suggests, he sought to describe and analyze the vowel system of Ghanaian English as spoken by educated Ghanaians in the country. Before this study, there had been several works which tried to characterize and create an inventory of the vowels articulated by Ghanaian English speakers. Key among these works was the one by Ofori, Dua and Minta (2014), who created an inventory of the sounds of the Ghanaian English. However, their work was based on impressionistic analysis and hence there was no room for categorical description and concrete support to their findings. As a result of this Ankomah (2017) sought to analyze these sounds acoustically to gain and provide scientific evidence that was categorical enough to help distinguish the sounds of Ghanaian English. His area of interest and research was on the vowel system because impressionistic analysis of vowels, as evidenced by scholars such as Roach (1988) and Cruttenden (2011), is not quite adequate and encompassing enough. Consequently, his work aimed at identifying the vowels articulated by Ghanaian speakers of English by using acoustic models, with the primary intent of creating a scientifically-backed inventory of the vowels in GhE.

Forty respondents, all with at least a University degree, served as the source of data. A short conversation and an interview were conducted to create tokens of words and sentences which contained the actual vowel sounds he wanted to study. After analyzing the data, Ankomah (2017) came out with the findings that Ghanaians generally articulate eleven vowels, /i:, ɪ, e, a, a: ɒ, ɔ:, ʊ,

u: ʌ, ə/. Of these 8 were regular (/i:, ɪ, e, a, ɒ, ʊ, u: ʌ/) while the remaining three (/a:, ɔ:, ə/) were used inconsistently. This particular finding is contrary to the already existing claims held by previous researchers in the field. The reason which accounts for their misrepresentation is huge because most of the pioneering scholars used impressionistic analysis to arrive at their findings. However, with the use of the acoustic software, things that could be hidden from someone doing an impressionistic analysis will be revealed to you for a broader and more thorough analysis (Cruttenden, 2011; Roach, 1998).

The study also demonstrated that females use higher formant frequencies than males, although this does not affect the quality of the vowels. Further, the study brought to the fore that non-native English should not be studied like native Englishes because when this is done, there will be series of "oversimplification and overgeneralizations" (Ankomah, 2017, p. 173). In this regard, he proposes that the phonemic features of non-native Englishes should be adequately studied to create better descriptions of non-native varieties. Finally, the study confirmed that the real identification of a vowel usually lies in its quality and not necessarily the duration. A point which is supported by several scholars (e.g., Harrington, 2010; Ladefoged & Disner, 2012).

This study is central to my work since it serves as the direct point of reference for the most current description of vowel sounds in Ghanaian English. My current work will, therefore, build on this and investigate some vowels articulated by Ghanaian English speakers. The point of departure will be the range of respondents for the study as well as the vowels which will be selected for analysis.

Summary of Chapter

This section of the work has reviewed the underlying theories used for the work. In addition to those, some important studies which relate to the currect study were discussed. In the next chapter, I discuss the methodology of the work.

CHAPTER THREE

METHODOLOGY

This chapter of the thesis will discuss the methods which were employed for the study. The research design for the study, the sample and, sampling techniques used, the means and processes that I used to collect and analyze the data will also be discussed. Moreover, the tools which were used for measurements and the challenges faced during these processes will be adequately discussed here.

Research Design

The research design that was adopted for this study is the mixed-method design of both quantitative and qualitative methods and the approach used is experimental. According to Johnson et al. (2007), the mixed-method approach advances the use of and the mixing of quantitative and qualitative data within a single investigation. According to them, the basic premise of this design is that the integration of the two permits a more complete and concrete utilization of data than doing separate quantitative and qualitative data research and analysis. Due to the effectiveness of this method, recent scholars who use it refer to it as "pragmatic" simply because it is and highly effective.

To provide a better understanding of the research problem of this study, the quantitative method catered for the close-ended information and behaviours. It also addressed the statistical analysis of the data such as the mean, frequency, standard deviation, ANOVA. The description of the acoustic vowels was done qualitatively.

Population and Study Site

The study is aimed at characterizing the vowel qualities and duration of Akan, specifically Fante speakers of English in the Cape Coast metropolis. The Fantes were selected because I wanted to focus on a specific group and study them in detail for a comprehensive analysis of their speech patterns. The reason for this was to test whether a homogenous variety had differences or similarities, a finding which would help my understanding of other varieties in due course for later studies. This, therefore, limited the study site to the Cape Coast Metropolis and its environs. The reason behind this choice is as a result of the academic inquiry I sought to explore and the convenience and familiarity I have with the community and people of the Metropolis informed the decision. Also, the subjects I wanted to study reside here so there was no need to choose a different place.

Respondents who are Fantes and have lived most of their lives in the Cape Coast Metropolis were engaged to serve as the source of data. In doing this, I embarked on a meticulous screening exercise (discussed in detail in later paragraphs) to make sure the targeted respondents were selected for the study. The study focused on Ghanaian speakers, specifically Fantes who live in the Cape Coast Metropolis and have lived there for a considerable part of their years. To do this, the respondents were asked for their ages and if they had stayed in Cape Coast for more than half of their age. This meant that those individuals who fit the criterion could be said to have spent most of their lives in Cape Coast and that they were not prone to excessive influences from other places. This practice was adopted by studies such as Labov (1966) and Chambers (1995) in their longitudinal studies, which proved very successful.

So, to have purely Fante homogenous respondents, a short interview was conducted when there was the need, whereby those who have lived outside Cape Coast for a longer period of their lives were exempted from the study.

Another thing that is of essence is that the work did not target any specific academic level or qualification; and since the work was using age as a variable, any Fante who had lived in Cape Coast most of their lives (discussed above) and could read English proficiently was selected for the study. This means that people with varied educational backgrounds were selected for the study. Age as a sociolinguistic variable has been accorded different meanings and categorizations. Tannen (1984) categorizes age into aspects such as biological, social, economic, and historical. For this study, the biological age was used. The biological age, according to Tannen (1984), talks about the years a person has lived after birth. This is generally regarded and accepted as the most common form of age categorization the world over. In drawing boundaries for biological ages in sociolinguistic studies, Tannen (1984) asserts that we can classify the ages between and within 25 years, suggesting that we can have groups such as those who fall within 0-25 years as one set, those who are between 26-50 as the next set and those who are 51 and above as the last group.

This age group was chosen because it makes for easy representation in the Ghanaian setting on the one hand. On the other hand, these age groups can at the same time represent a socio-economic variable in society. Generally, in the Ghanaian context, people who have the opportunity to access education to the highest-level leave school between the ages of 23 to 25, those who are between 26 and 50 are also seen to be engaged in a particular trade or occupation

and those who are 50 and above have worked for a long period and are either retired or nearing retirement.

Again, these age grading groups allow the researcher to characterize the respondents on the lines of the Dynamic Model of World Englishes. Ghana is generally regarded to be in the nativization stage of the dynamic model (Huber, 2008). Therefore, the selection of these groups can describe the stages that the English in Ghana has gone through. Those aged 50 and above easily represent the Foundation stages of the transplantation of the language in the country after independence from colonial rule. Those who fall within the second-year group (26 to 50) represent the Exornormative Stabilisation Phase while the last year group (0-25) represents the Nativization Phase of the model. Putting all these reasons together, the selected age grading was appropriate for the study.

After the age-grading was set, 18 respondents from each of the groups were identified and interviewed for the study. For the 0-25year group, the study focused solely on students who spread across the different educational levels in the country. To achieve this, some schools, namely the Calvary Hillcrest Basic School, the University Junior High School, St. Augustine's College, and the University of Cape Coast were selected as sites to acquire respondents for the study. These schools were selected because a working rapport had already been built between us due to an earlier pilot study I conducted with the schools (Calvary Hillcrest Basic School, University Junior High School, St. Augustine's College). I was a member of the University of Cape Coast community so gaining entry was not very difficult.

With the second group, people who were in the working circles were selected as I observed that would be the right place to get the respondents.

Subsequently, three (3) respondents were obtained from Prudential Bank, Cape Coast; another three (3) from the Ghana Commercial Bank, Cape Coast; I also got 7 teachers, two (2) from the University Junior High School, another two from the Holy Child High School, and one each from the Wesley Girls' High School, the St. Augustine's College, and the Oguaa Secondary Technical School; three (3) medical doctors from the Cape Coast Teaching Hospital; two (2) hotel managers, and one lecturer from the Department of Arts and Business Education Department of the University of Cape Coast.

Finally, one (1) medical doctor was obtained for the third group; I also had the opportunity to include six (6) retired people who were not engaged in any form of work; there were also three (3) retired people who engaged in part-time teaching; two (2) clergymen; four (4) active teachers and two (2) judicial workers agreed to the study and were interviewed to make up the last group. These groups of people constituted the respondents for the study. My relative proximity to the study site, together with the familiarity I had with some of the respondents, and the help I got from some friends, family, lecturers, and well-wishers made the data collection very interesting and this also made the analysis very conducive and encouraging, as most of them were more than willing and cooperative to the progress of the work.

Sampling Procedure and the Sample Size

The study employed the non-probability sampling technique, specifically quota sampling to help select respondents for the study. Quota sampling is a sampling technique wherein data is collected from a homogenous group. It involves a two-step process where two variables can be used to filter information from the population. This method is usually used when reasonable

differences in the measurement of a variable between groups are expected. According to Johnson et al. (2007), quota sampling improves the accuracy and representativeness of the results by reducing sampling bias.

After categorizing the respondents into groups, I then selected people who represented each group and made sure I had an equal number of representations for each group. With the first group of respondents (0-25), I sought permission and assistance from the heads of the basic school, junior high school, and senior high school. The heads and the teachers were informed of the fact that only students who were Fantes and had lived in Cape Coast for close to or almost all their lives were needed for the study. The teachers, therefore, did their best to provide students who fit my stated criteria to be interviewed. After this was done, I took the time to interview the students by asking them a question or two with the view of soliciting information from them to inform my decision to include or exclude them. With the tertiary students, a short interview was conducted. Mainly, I asked them their ages and a summary of their educational life. I asked questions that pertained to how long they had stayed and schoolled in Cape Coast and how long they had lived elsewhere. This informed my decision whether to include or exclude them from the study.

A similar thing was done for the second group (26-50). I asked the managers at the banks, the administrators at the hospitals and, the managers in the respective schools for assistance. Respondents who possessed the required characteristics were then selected and their speech, recorded for the analysis. Some of the managers in these institutions were very interested in the study because they felt the society normally ignores them in these kinds of activities. Some of them charged their workers to cooperate fully for a reward and the fun

of it, the workers, on the other hand, showed a greater delight in the work and contributed immeasurably.

For the final group, I had to contact people in authority in these spheres of engagement. From a distance, I felt it would be difficult for me to get the older generation to participate in the study. My conviction, I later realized, was rush and unjustified. The older respondents showed unparalleled commitment to the work. I contacted the Pensioner's association for instance; they complied and sent the word out. Within days, I received numerous calls from people who were ready to get involved. For those who were still in the coorperate and the academic circles, I sought permission from their supervisors before engaging them in the study.

The data set also had a good gender representation which was based on the number of respondents available from the sampled respondents. I was able to obtain 8 males and 8 females from all the age groups, therefore creating a uniform gender balance.

It was also ensured that people who displayed speech disabilities were exempted from the study. This was not a discriminatory act but due to the delicate nature of the voices in the spectrogram and the measurement of duration, it became impossible to include such respondents. This was because in the pilot study, I interviewed some students who had mild speech disorders and it turned out that their speeches were almost unreadable in the spectrograms. However, when I encountered such respondents in the actual study, I explained it to them, and in some cases, they were allowed to partake but I did not include those in the analysis.

Acoustic studies are usually very demanding and the analysis is time-consuming so a sample size that would be adequate and at the same time possible for analysis in the short period had to be chosen. In all, I recorded 60 respondents for the study but some of the recordings did not come out as expected so they were not analysed. After careful selection and consideration, 48 respondents were settled upon. Each respondent was asked to read 32 target words that contained the vowels of interest. Altogether, 1536 tokens of vowel sounds were pronounced for detailed analysis.

Stimuli/Instrument

This describes the kind of speech elements used in producing the needed sounds for analysis. The speech materials used in the study were sets of monosyllabic and some disyllabic words with structures such as CVC, VC, CVCVC among others. The total words used in the study were 32 and out of this number, 22 were monosyllabic including but not limited to the following structures h*Vd/hVt, pVt, bVd, kVp, dVd, dVd.* Wells (1982) terms these set of words as lexical sets which serve as a means of acquiring the vowel sounds. In essence, the phonological environments of the words are restricted and, as such the target words occur only in a stressed syllable of a content word. It is, however, important to note that these words were embedded in carrier phrases to make it appear in a naturally occurring environment.

The contexts selected for the study have been generally used in several studies such as Cox (2002), Ankomah (2017), and Awoonor-Aziaku (2018). Besides, the fricatives which were used also posed no phonological threat because they provide easy recognition of the sound segment during the analysis.

I will now present a picture of some concatenated sounds to display some of the sounds present in the stimuli and how they appear in the spectrogram

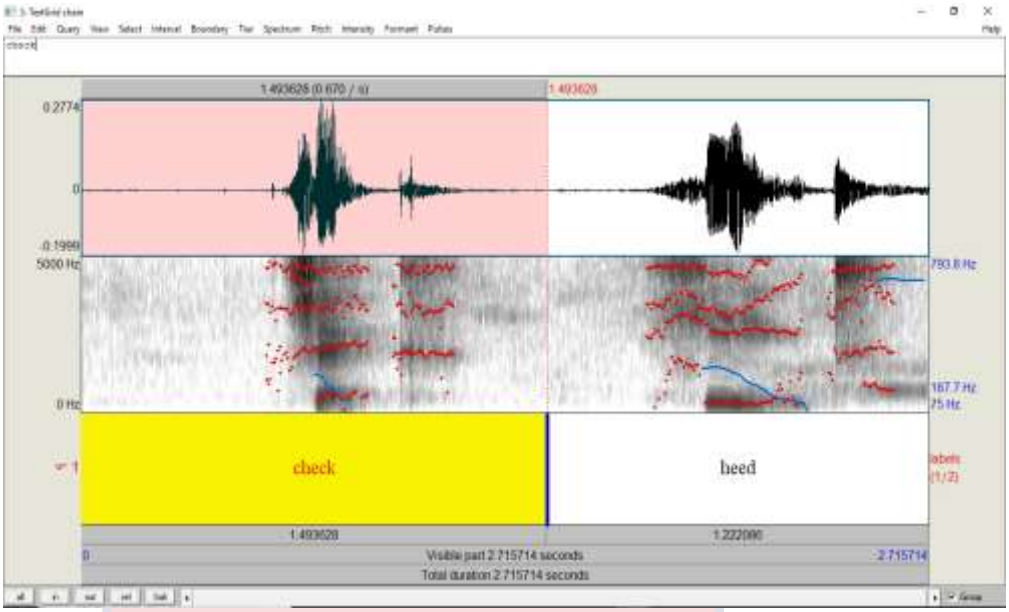


Figure 2: A spectrogram showing a female speaker's spectrum of 'check' and 'heed'

The picture above shows how the words appear in the spectrograms. The first section (highlighted yellow) shows the pronunciation of the word, 'check' while the second one (shown in white) represents the pronunciation of the word, 'heed'. To test the effect of the phonological environment on the length of vowels, I included some vowels in the voiced and voiceless environment. This was specifically done to either support or dispute the on-going argument about the fortis/lenis effect. The fortis/lenis effect describes the presence or otherwise of long and short vowels and whether their length is determined by the phonological environment they find themselves in (Hay, 2018). Below is the list of words that were used as carriers for extracting the vowels

Table 1: List of Carrier words for extracting the vowels

KIT	FLEECE	DRESS	NURSE
Hit	Bead	Bed	Herd
Hid	Eagle	Dead	Bird
Pit	Keep	Exam	Aired
Chip	Heap	Dress	Dirty
Itch	Heed	Egg	Curb
Thick	Deed	Pet	Early
Pity	Heat	Head	Third
Bid	Peak	Check	Chirp

Data Collection Procedure

The targeted respondents were contacted and told about my intent to engage them in the study. Those who agreed to participate fixed times and venues which were convenient for both parties. As maintained by Ladefoged (2001) and Foulkes and Hay (2015), the recordings for acoustic studies should be devoid of all noise intrusions to generate the required and accurate formant values for analysis. As a result, all the recordings were done at very convenient and quiet places.

During the recordings, the headmasters and teachers of the schools gave us the quietest places in their institutions. We either used the ICT laboratories or a secluded office space where there were few to no obstructions. With the university students, they were recorded in an enclosed room after lectures, when there was very little to no noise. The respondents of the second and third groups were also recorded either in their private offices or at a convenient place devoid of noises. There were also instances where I was able to schedule meetings with some of the respondents to go to their homes and make the recordings. All these were done successfully without any major issues.

After giving their consent to participate, which was done through verbal interactions and the help of an introductory letter, the work was adequately explained to the respondents before the recordings began. They were told to ask any questions which bothered them; they were also told that they had the opportunity to opt-out whenever they felt like it. Further, they were made aware that they could ask for the recordings to be done again if they felt they were not satisfied with what they produced. When all these were done, the reading material was given to them to go through before they started reading for the recording. Also, practice sentences and words were given to them to try before the actual stimuli and recording began. Anybody who had any difficulty with a word or phrase had the opportunity to ask for clarification.

Consequently, the actual stimuli and the period for the recording followed those preliminary steps outlined above. The stimuli/material for the recording was categorized into three sections. Sankoff (2005) classifies reading stimuli into formal and informal. The formal, which was used in this instance, and which the respondents had to read, constituted carefully constructed sentences that contained the target words.

The respondents were first asked to go through the sentences with no clue of the target words which were to be analyzed about their speech. When they were ready to begin, I encouraged them to speak as freely as possible since their identities would not be disclosed. During the recordings, two devices were used to prevent any possible mishap. A Sony Digital Sound Recorder SX 345.67 was used alongside a Sharp V3 sound recorder. The sounds were recorded in WAV form, the form which is readable by Praat so it reduces the burden of having to convert the files after the recording.

Also, a mini-laboratory was created for the recordings. A headset was available for those who felt shy and did not want to hear themselves. Also, the microphone which comes with the sound recorder was placed approximately 5 inches from the respondents' mouth to obtain the required standard and the perfect voice (Baranowski, 2007). Subsequently, the respondents read the material as was required of them in approximately 1– 5 minutes because they were told to read at a very normal pace and to take a breath or two after each sentence.

After the recordings were done, the researcher gave a little token to the respondents, especially the children, for their contribution. Some people asked after the recordings what I was looking for. I was honest to them by telling them I was looking for the vowel qualities and duration. However, the respondents were not allowed to redo the reading after telling them what I specifically set out to look for. The data collected was then uploaded unto the Praat Software for analysis.

Method of Data Analysis

Vowel Duration

It is important to note that there has not been an absolute system that is unanimously agreed upon as the means of measuring the duration of vowels. This notwithstanding, it is regarded as an essential component in the analysis of vowels across languages (Ladefoged & Maddieson, 1990). In this study, the measurement of the duration of the vowels was done by selecting from the approximate onset of the vowel to the end of the vowel. That is the main amplitude lump in the waveform with the corresponding formant structure in

the spectrogram. Figure 1 below illustrates the duration measurement of the vowel /i:/ in /heed/ of a male speaker.

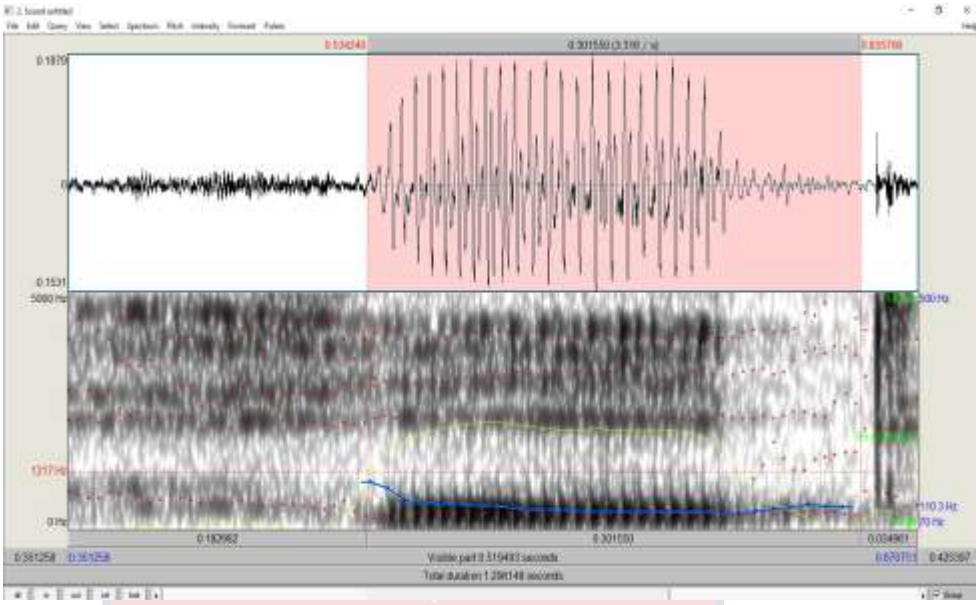


Figure 3: A spectrogram of the word "heed" highlighting the vowel /i:/ as pronounced by speaker A.O.

The highlighted part of the spectrogram above shows the sound [**i**:] as articulated by speaker A.O. In the spectrogram, I tried to avoid the selection of the part of the sound that could include the preceding and the final sounds. Foulkes and Hay (2015) recommend that one should be 'generous' when selecting the portion for measurements to prevent accidental exclusions of parts of sounds. Therefore, in my analysis of the vowel duration, I zoomed in on the vowel of interest and tried to avoid the preceding and closing consonants. I did this by avoiding the first two millimeters at the onset of the vowel and the last two millimeters at the end of the vowel. This was uniformly used to measure all the durations of the vowels. The number immediately below the selection is the duration in seconds (in the example above, the duration of the vowel is 0.3016 sec). Wright and Nichols (2015) recommend that the researcher should stick to a particular model of selecting aspects for the duration to avoid bias.

The Vowel Formants

In trying to analyze the quality of the vowels, the formants of the vowels were recorded and analyzed. According to Ladegoged (1975), the first two formants (F1 and F2) are the most appropriate for describing vowels. The first formant represents the height of the vowel, whereas the second formants represent the front/back description of the vowel. Occasionally, the third formant becomes useful for analysis in some studies, due to the choice of the normalization procedure used in normalizing the vowels (Thomas and Kendall, 2015). The formants were recorded from the speech of the respondents using the PRAAT computer software version 6.0.12 (Boersma, 2020). PRAAT is free software that is available for download on the internet. It has an in-built LPC (Linear Predictive Coding) and a formant tracker which helps in identifying and extracting the formant vowels. When the speech of the respondents is opened in the PRAAT window, a display of that speech is exhibited in a pop-up window (known as the Spectrogram). Based on the sex of the speakers, the frequency range of the formants was changed from 5000Hz to 5500Hz for males and females respectively and an analysis window which approximated 1.5 to 1.8 seconds. This approximation helps to better appreciate of the waveform of the sounds. The target words which contained the vowels were then extracted and subsequently segmented and annotated to get an obvious representation of the word/vowel in the spectrogram. After the annotation, the extraction of the formants of the vowels was done. Here, the steady part of the center frequency of the sound was selected. The center frequency is selected to prevent the influence of the preceding or post ceding sounds around the vowels.

There are three distinct ways of measuring the vowel formants in the PRAAT software using the in-built LPC analyzer. The first is by clicking on the lowest red dotted lines in the spectrogram (this represents the first formants), the second and the third red dotted lines, representing the second and the third formants respectively). A figure pops up at the left-hand side of each dotted line after clicking and then the figures can be recorded. This method, according to scholars such as Ladefoged and Johnson (2011), and Gut (2009), can sometimes be misleading since the formants can automatically jump or clamp down thereby giving a false manifestation of the actual vowels. The second method is by clicking on the 'Formant Menu' and then using the 'Get formant' menus to extract the vowels. This method is very reliable but it involves a lot of clicks and the figures too are not approximated, thereby giving the researcher another task of approximating the figures after the extraction. The third method, which is part of the latest modification, and which I used for extracting the vowel formants, involves selecting a portion of the center of the vowel and then clicking the 'Query' option which gives the option of 'Log Two'. This log gives you the approximated figures of the first three formants of each vowel. These figures were then copied and recorded in an excel workbook for later statistical analysis. The formants, the pitch and the intensity of the vowels are shown in Figure 4 below

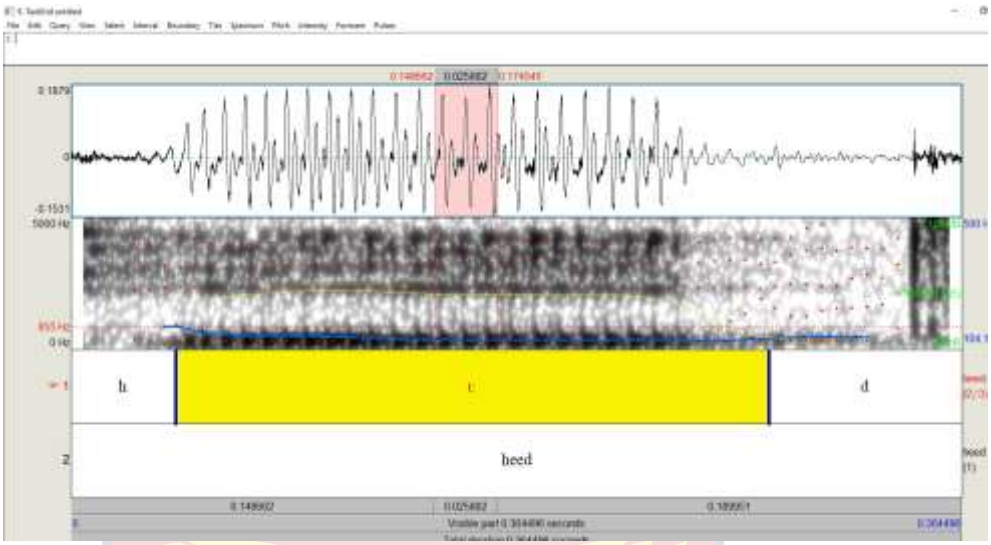


Figure 4: Spectrogram of the word 'heed' with its annotation

The figure 4 above illustrates the segmentation and annotation of /heed/. The blue line indicates the pitch of the sound, the yellow line indicates the intensity. The vertical pulses specify the vibrations of the vocal cords during the speech and the selected portion in pink designates a center frequency of the vowel for the extraction of the formant values. The red-dotted lines show the formants of the vowel which is measured in Hertz (Hz).

Vowel Normalisation

Ladefoged and Johnson (2011) assert that three types of information are provided when a sound is spoken. The first is the phonemic information, which this describes the intended phonemic identity of the vowel, the second is the physiological information about the speaker's vocal tract shape, gender, and just the anatomical make-up of the talker; the third is the sociolinguistic information, which mainly borders on the speaker's marked characteristics such as ethnicity, social class, age, socioeconomic class among others. All these three respective details are known to affect the formant frequencies of the speakers in any speech event (Adank et al., 2004). Of these three, the one which has been treated as

irrelevant to the analysis of sounds is the physiological or anatomical information that accompanies speech. This is because males and females have different vocal tracts and hence, this difference will result in different speech sounds. It is therefore right trying to eliminate these differences to get sounds that are unique to each of the respondents. Consequently, scholars have utilised several systems and techniques to do away with these unwanted features to have data which is characteristic of just the right variation needed for analysis. It is for this reason that they came out with specialized techniques for normalizing the vowels of a language by doing away with these physiological features.

One key area in the area of vowel analysis which helps to curb some of these differences is the vowel normalization. To appreciate, and effectively study the vowels of individuals, several normalization techniques have been outlined. These techniques arose from the fact that humans have varied physiological differences such as the size of mouth, length, and size of vocal cords among others. Normalization is thus important because, to prevent a variation in vowel resonances as a result of physiology, a suitable technique has to be applied to study the realizations of vowels in a steady and systematic linguistic and sociolinguistics ways. For instance, two people from the same community may have different formant frequencies. When the vowels are not normalized, it will be very difficult to decipher whether the difference between their formants and resonances are as a result of physiological characteristics or the actual sociolinguistic variation.

Another well-known fact is the claim that two speakers may produce vowel sounds that are very similar but may have very different formants. Simultaneously, they may produce vowels that sound phonetically different but

they may have very similar vowel formants (Chambers, 1975). Consequently, Thomas (2002) has outlined four general goals which underpin vowel normalization (1) to eliminate variation which is as a result of physiological differences, (2) to preserve the sociolinguistic/dialectal or the cross-linguistic differences in vowel quality, (3) to preserve phonological distinctions among vowels and, (4) to shape the cognitive processes that usher the human ear to normalize perceived vowels.

In later studies, scholars divide the goals into respective fields. Chambers (1995), coming from the purely phonetic point of view, assume Goal 4 as the ultimate in vowel normalization, taking a more skewed position as regards the other goals. However, for sociolinguists, the first two goals are crucial since they prefer a model that can filter out the physiological features of sounds and leave just the sociolinguistic variation for analysis.

In further trying to describe the techniques, scholars categorize the normalization systems into two broad categories; vowel intrinsic and vowel extrinsic. The two differ in the sense that the vowel intrinsic technique uses information from a single vowel token to normalize vowels. On the other hand, vowel extrinsic uses tokens of different vowels to create the normalization sequence. This technique has been widely used in studies such as Awoonor-Aziaku (2018). Both techniques use the formant frequencies (F1, F2, sometimes, F3, and seldom F4) to calculate and normalize the vowels. Since normalization is effective in eliminating characteristics that are particular to a speaker, the tools have become crucial in the classification of vowels.

There are, however, some challenges that are associated with vowel normalization techniques. Jones (1967) reports that using the normalization

technique stands the tendency of introducing new irregular patterns into the description, especially in situations where the languages to be studied are not phonologically similar. Chambers (1995) also reports that using the normalization techniques often takes away some of the sociolinguistic variations in the data, as regards the physiological features. However, in 2001, Labov conducted a study which sought to look into some of these claims and came up with the conclusion that some of the assertions of these scholars are too strong and directed and that the sociolinguistic variations are still evident in acoustic data after normalization, a claim which was later supported by Adank et al. (2004) when they did a thorough analysis of the suitability and effectiveness of normalization techniques in variation study

After assessing all the available techniques, the one I selected for this study is the model propounded by Labov in 2006.

The Labov Model (Speaker Extrinsic)

The vowels of each respondent were normalized using (NORM), which is an online software developed by Kendall and Thomas (2010). It contains several normalization methods but the one I decided and settled on to use for this study is the one propounded by Labov et al. (2006). This approach was originally designed during the phonological exploration for the Atlas of North American English. It is a modification of a previous model advanced by Nearey in 1997. The procedure uses a log-mean method to normalize the formant values by computing a single grand mean for all the speakers involved in the research. This particular phenomenon is known as the speaker-extrinsic method (as discussed above). Moreover, the procedure generates a 'scaling factor' for each speaker, which is subsequently used to alter each person's vowel (Thomas and

Kendall, 2010). Thus, the speaker-extrinsic quality of the procedure helps it to scale the original Hertz values as a part of its normalization exercise.

Labov et al. (2006) originally provide two methods (speaker-extrinsic, and using the Telsur G value). The latter (using the Telsur G value) method does not compute the grand mean for all the data from the speakers. It rather uses the constant value G=6.896874 as the grand mean (Labov et al. 2006; 40). The former (speaker-extrinsic) and the model which was used in this study follows that a logarithmic grand mean, G, is calculated from the geometric mean of the natural log of the F1 and F2 figures of all the vowels of the speakers. A logarithmic mean value, S, is then calculated for each speaker by taking the natural log of the F1 and the F2 figures for all of that respondent's vowels. The anti-log of the difference, G – S, is taken for the F, the scaling factor for that speaker. Afterward, each individual's formant values are then multiplied by the scaling factor to get their normalized values.

Some Advantages and Disadvantages of the Labov Model

Adank et al. (2004) found that it performed well in discriminant analysis of normalized Dutch vowels in reducing physiological variation, and no worse than the other methods compared at preserving sociolinguistic variation. Further, they stated that it reduced scatter the best of all the methods they compared. However, just like other models, it performs better when the entire vowel system is included, which can be impractical for the studies of many speakers. This study did not use many speakers so the theory suits it well. Another disadvantage is that its effectiveness is slightly compromised when it is used to compare lects with different phonological inventories because it can

cause some skewing of the normalized vowels. However, this work studied a homogenous set of speakers so this was also nulled.

In the normalization process, the raw vowel figures of the individual speakers were first normalized and plotted. Later, graphs were drawn and saved for all these normalized values. The group means as well as the standard deviations of these speakers were grouped and plotted and all these together were used for the final analysis of the vowels.

Summary of Chapter

This chapter has discussed the methods which were used in collecting and analyzing the data for the work. Among the issues discussed are the study design, the population and the study site, sample and sampling technique and the vowel normalization process which was used for the analysis. The next chapter presents the acoustic analysis of the data.

CHAPTER FOUR

PRESENTATION OF ACOUSTIC RESULTS

This part of the work answers the first research question of the work. Here, the acoustic characteristics of the male and female speakers and the three age groups will be discussed.

General Description of the Vowels

I begin the analysis of the results by presenting a general picture of the graphical representation of the vowels understudy as pronounced by the speakers. This is to provide a picture of how the analysis will be done in this section as regards the vowels and the graphs. It is also important to mention here that the graph, as presented in Fig.1. has two distinct axes (the X and the Y) with formants one of the speakers presented on the Y-axis (the height of the vowel) and formant two on the X-axis (the back-front description).

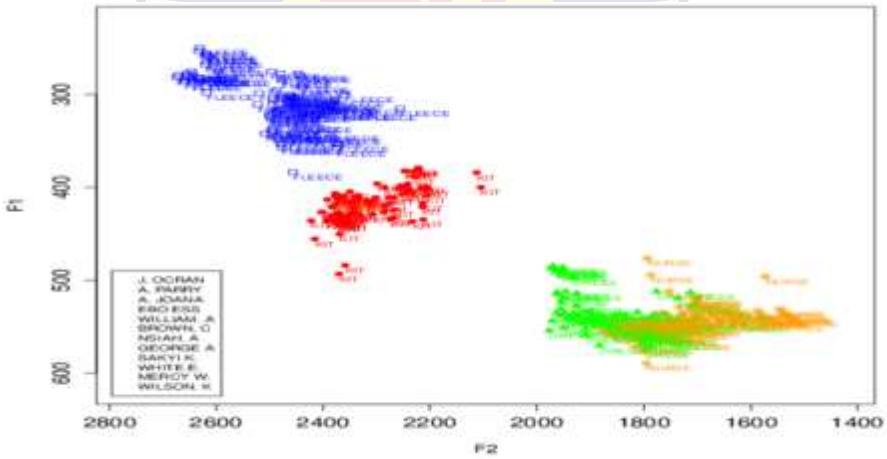


Figure 5: Normalized F1 & F2 frequency values of the individual vowels /ɜ:/, /e/, /ɪ/, /ɪ:/.

Fig. 5 above describes the acoustic vowel spaces of the vowels under study. They are represented with different colors to make the identification easier and clearer. The blue represents the FLEECE /ɪ:/ vowel, the red the KIT

/ɪ/ vowel, green is for the DRESS /e/ vowel, and finally yellow for the NURSE /ɜ:/ vowel.

From the picture above, we get the first indication that the majority of the speakers were able to articulate the vowels in the correct vowel spaces although there are variations and an overlapping incidence of the DRESS and the NURSE vowels. The KIT and the FLEECE vowels are all situated in their appropriate context based on the textbook presentation and description of the vowels of the English language. The overlap of the DRESS and NURSE vowels is very common in the speech of some studied varieties such as those reported by Milroy (1981) in Belfast and recently by Awoonor-Aziaku (2018) in the Ewe speakers of English in Ghana.

In the subsequent discussion, the various realizations of the individual vowels will be discussed using the textbook description of the RP vowels as a model for comparison and analysis. Before that, however, I want to present a picture of the mean frequencies of the vowels to paint a clearer picture of the articulation of vowels by the Fante under study.

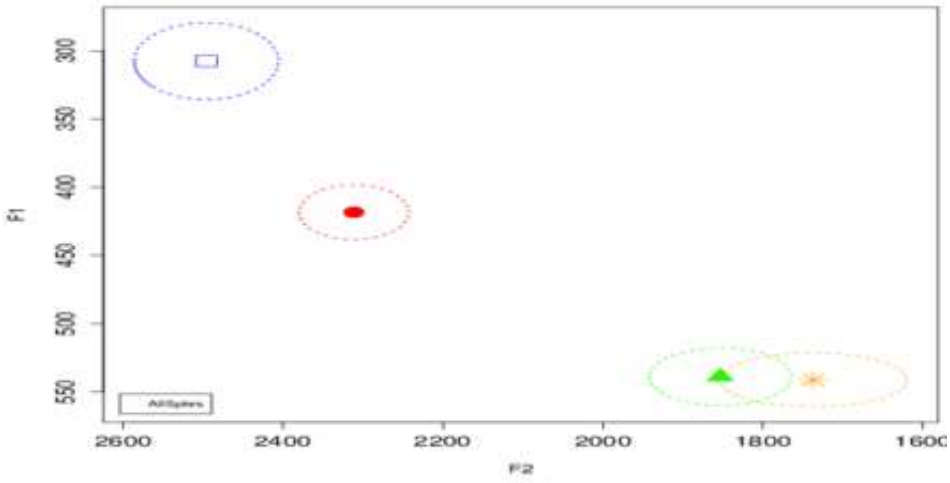


Figure 6: A normalized graph showing the mean frequencies of the vowels /ɜ:/, /e/, /ɪ:/, and /ɪ/

From the graph above, it can be seen that the FLEECE vowel is retracted, the KIT vowel, on the other hand, is lowered and the overlap of the DRESS and the NURSE vowels is represented in the confluence of the two rings. It is important to note, however, that there were several instances where the vowels were realized in different spaces, with some being pronounced in a different space altogether. All these will be duly discussed in the next paragraphs where a detailed description of the individual vowels, as well as their realizations, will be discussed. The lowest age group will be discussed first and then the others will follow in the ascending order. For each group, the KIT and the FLEECE vowels will first be discussed along with the gender division of males and females.

Discussion of the Kit and The Fleece Vowels

The Lowest Age Group

These two vowels are discussed together because of the similarities and peculiarities that were identified among them in the study. For this, I will present an acoustic graph of all the instances where the two vowels were realized by the speakers and the respective vowel spaces that they were identified.

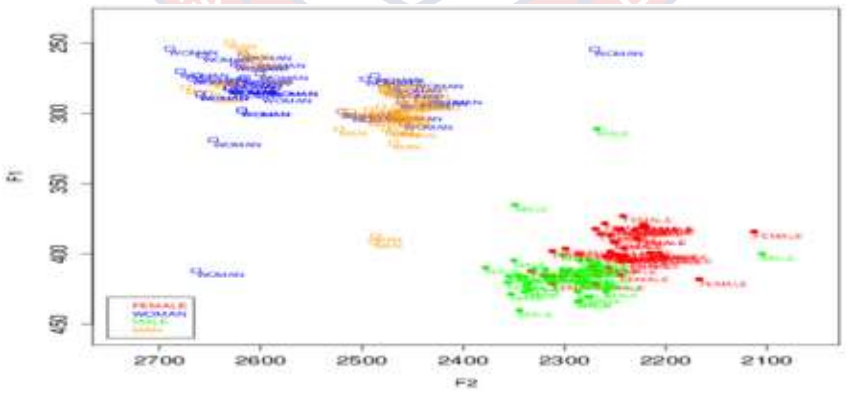


Figure 7: F1 &F2 plots of all the KIT and the FLEECE vowels by the speakers in the lowest age group

The graph above describes the various realizations of the KIT and the FLEECE vowels as pronounced by the youngest speakers in the study. For easy identification, the female speakers were represented with the colors red and blue while the males green and yellow for their representation.

The FLEECE /I:/ Vowel

The first glance at the graph above triggers a notion of disparity in the pronunciation of the sounds as regards the gender of the respondents. Dwelling on the FLEECE vowel, it is obvious from the plot that the female speakers have a relatively fronted and raised variant of the vowel as compared to the males, who have a relatively lower and more retracted variant of the same vowel. With the same vowel under discussion, it is also evident from the graph that there were instances where the vowels were produced in very unlikely vowels spaces. This is nothing of significance since I consider these occurrences to be as a result of errors on the part of the speakers and nothing more to it. There are also cases of overlap in the realizations of this vowel. However, it can be deduced from the graph that the females had a general number of retracted and fronted FLEECE vowel as compared to the males. It is also evident that the males had a more lowered and extended variant of the vowel as compared to the females.

The KIT /ɪ/ Vowel

The KIT vowel shows a reverse as regards the positions and the vowel spaces in which the vowels were produced. From the graph, we see that the males, represented with green, have a more fronted and lowered variant of the vowel as compared to the relatively retracted and the raised realization of the vowels by the females. I ascribe the retraction and the raised variant of the females' realization of the KIT vowel to a change that is happening in Ghanaian

English. Today, most young people, the females, in particular, pronounce the KIT vowel very close to the standard and prestigious varieties as exhibited in the textbooks for the RP phoneme of the vowel. This particular occurrence is in line with the views of scholars such as Sankoff (2006) who state that panel changes in sound change are most often, in varied contexts, pioneered by the younger generation. It is not surprising, due to the influx of several outlets (e.g. movies, social media) that allow today's Ghanaian child to have access to the trending accent of the native speakers of English and consequently leads to the gradual adoption of these variants. There is an aura of prestige around the youth when they pronounce the vowel this way and as a result, it is gradually becoming a feature recognizable with the new generation of Fante speakers of English.

It was, however, noticed that the KIT vowel was approximating the /e/ vowel spaces. Out of the 512 tokens of the KIT vowel, 112, representing 22%, articulated the vowel as close as [e] with 25 (5%) realizing it as close to [i:]. The impact of these variations is discussed at length in the next chapter.

I present a standard deviation of the mean and elliptic representation of the two vowels as pronounced by the speakers

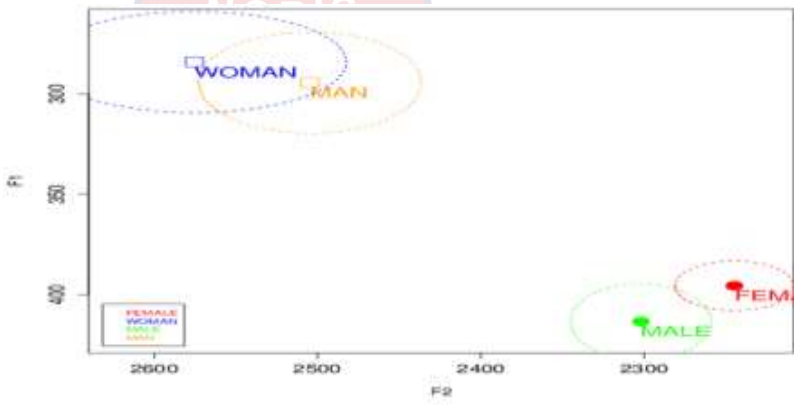


Figure 8: An ellipted graph showing the mean and standard deviation of the youngest speakers realizing the KIT and the FLEECE vowels

It is evident from the graph above that there were no new variant realizations of the two vowels. All the vowels were pronounced in the textbook vowel spaces equated for these vowels, with the females realizing the KIT vowel in a very close approximation to the standard variety.

The Middle Age Group

Before I talk about this pair, I will present a pictorial representation of the vowels as were pronounced by the speakers.

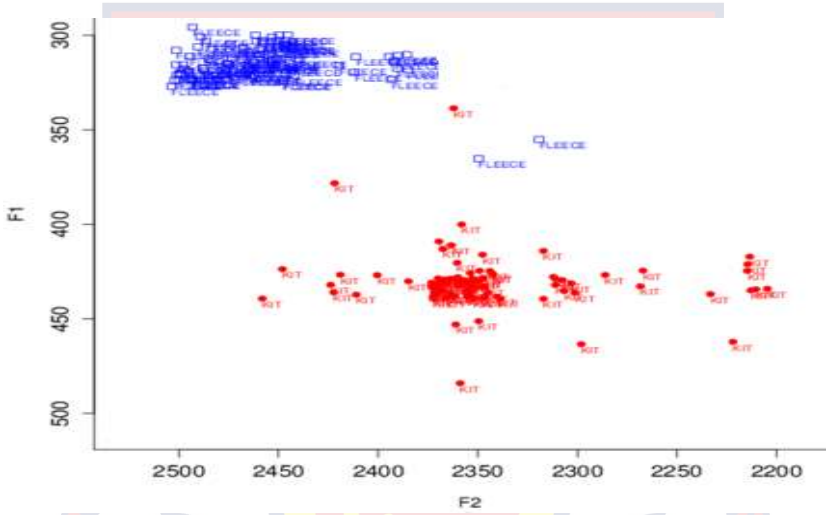


Figure 9: A scatter plot showing the individual realizations of the KIT and FLEECE vowels of the Fante speakers of English

The FLEECE vowels are represented in blue whereas the KIT vowels are represented in red for easy identification. From the graph, we can observe that the FLEECE vowels are relatively lower ranging mostly from 312Hz to 360Hz. There are also instances where we see two of the vowels being realized in completely different vowel space. However, I consider these as just deviations and therefore do not emphasize them. There is also evidence of some retracted tokens (12 representing 2%) towards the vowel space of the KIT vowel but higher in F1. I don't consider this to be serious since all these realizations fall within the same vowel space.

The KIT vowel on the hand shows a lot of variation as regards the respective spaces they occupy on the graph. However, it is salient to stress here that the vowels occupy a very retracted space. The reason the two vowels were plotted together was to present a broader graph for a good appreciation of the vowels. In the textbook presentation of the KIT vowel, it is generally located around 2200Hz; however, the approximate space that the KIT vowels occupy, concerning the middle-aged speakers is around 2350Hz. This shows the extent to which the F2 values of the vowels are retracted. It can then be asserted that Fante speakers who fall within the ages of 26 to 45 have a lowered realization of the FLEECE vowel and a fronted realization of the KIT vowel. As can also be seen here, there are several instances where the speakers' KIT vowels got retracted to the approximant textbook description. However, the volume is less as compared to those who realize theirs in the fronted space. Perhaps, in some years to come, the KIT vowel can become more retracted as was seen in the realizations of the younger speakers earlier. Perhaps this is a change that is being propelled by the younger speakers in this study, or maybe this was the standard and widely used variety in the country when these speakers under consideration were growing up. As to the tentative argument and the consequent result, only time will tell. Finally, it is worthy to note here that the F1 of the KIT vowels are also quite low in height. There is a gradual but observable movement towards the /e/ vowel but the difference is not particularly wide and therefore does not cause any serious alarms. The analysis shows that 42 tokens, representing 8% were fronted; 26 tokens, representing 5% were retracted towards the central vowel spaces; and 97 tokens representing 18% were lowered to the approximate [e] sound.

To make things clearer, I will present the ellipted standard deviation of the individual and mean frequencies in the graphs below

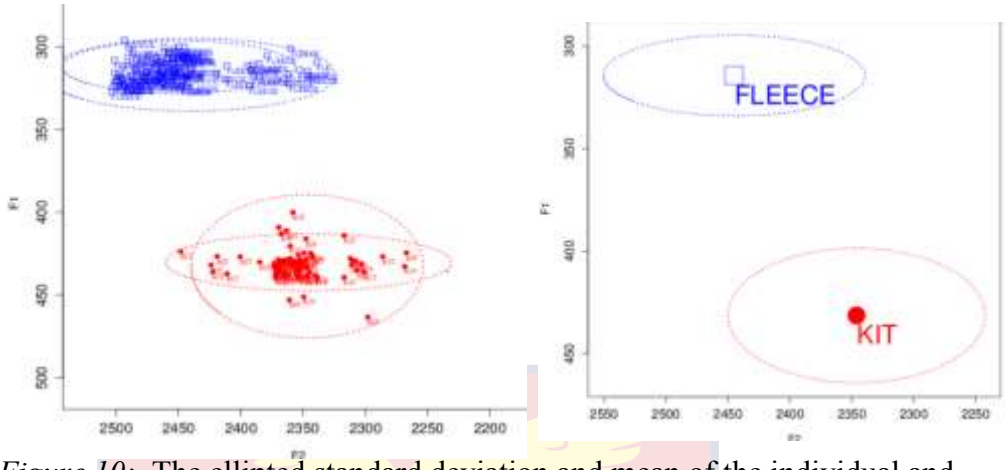


Figure 10: The ellipted standard deviation and mean of the individual and group realizations of the FLEECE and the KIT vowels

The standard deviation calculates the mean possible spaces in which all the available and realized vowels can be placed in the vowel spaces of the individuals. As regards gender, there was no real difference between the two speakers. However, the individual and the mean analysis of the vowels are presented below

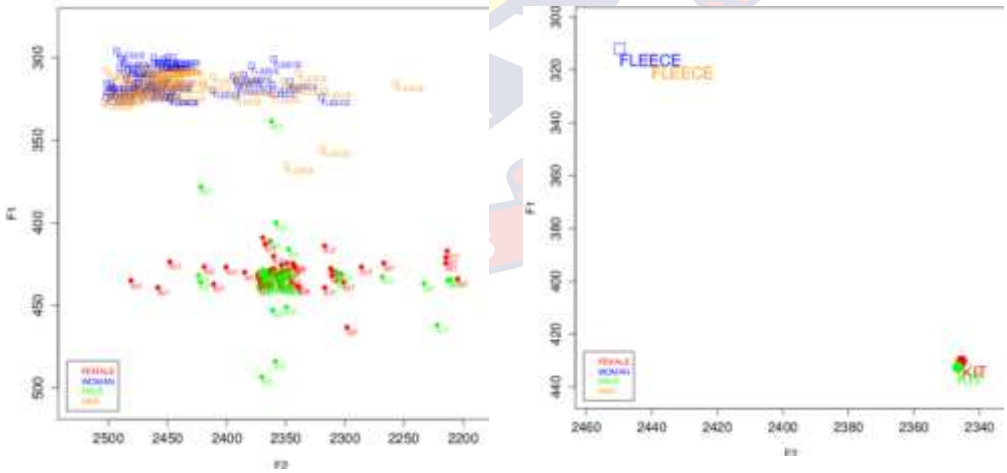


Figure 11: Gender variations of the KIT and the FLEECE vowels as realized by the Fante speakers of English in Ghana

For identification, the blue dots signify the females' rendition of the FLEECE while the yellow dots signify the males' rendition of the FLEECE

vowel. With the KIT vowel, the red dots signify the female speakers while the green dots signify the male speakers when we observe the spaces and the positions of the tokens, it can be concluded that both speakers pronounced the vowels under discussion in approximately the same vowel spaces with no observable differences between them. This is made clearer in the mean graph where we see the vowels being very close to each other. This can then help me to conclude that as far as the KIT and the FLEECE vowels are concerned, the speakers who fall within the middle age group do not make any observable differences as regards the vowel spaces in which the sounds were produced. I will now talk about the DRESS and the NURSE vowels.

The Older Age Group

The realizations of the KIT and the FLEECE vowels in the speech of the males and the females of the third group strata of the study are presented below;

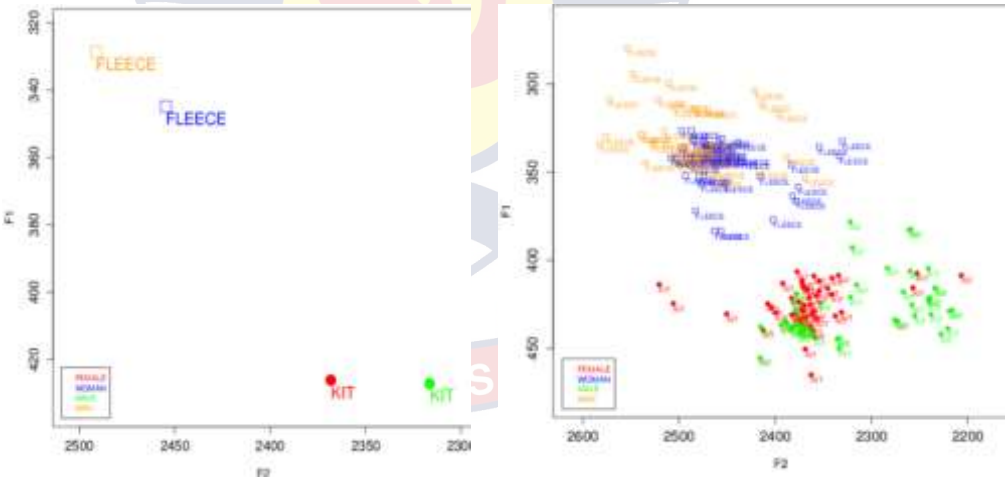


Figure 12: The individual and speaker means of the KIT and FLEECE vowels of the third speakers in the study

Fig. 29 presents a scatter plot for all the vowel tokens while Fig. 30 presents the mean of the individual genders in the realization of the vowels. from the graph in Fig 29. We get to know that both groups were able to realize the vowels independently of each other. It is also evident from the graphs that

the male speakers had a more fronted and raised realization of the FLEECE vowel as compared to the females, who had a slightly retracted and lower variant as regards the corresponding males. We, however, notice a reverse in the phenomenon about the KIT vowel. In this instance, the females rather had a more fronted variant of the vowel whereas the males had a more retracted variant. On the front-back dimension of the vowel, they are all seen to be situated on approximately the same point. Numerically, for the FLEECE vowel, the males had a mean value of 328.7Hz for F1 and 2491.1Hz for F2 while the females recorded 344.9Hz for FI and 2454.6Hz for F2. For the KIT vowel, the males recorded a mean of 427.1Hz for F1 and 2316Hz for F2 whereas the females had 426.1Hz for F1 and 2368.3Hz for F2. The analysis showed that 212 tokens, representing 41% realized the FLEECE vowel close to [e]. the Although we see some differences in the vowel, we cannot give any concrete conclusions as per the observatory discussion and hence the statistical analysis (in the next chapter) will help clarify and provide validating instances to help draw definite conclusions in this enterprise. A graph which shows the standard deviation of these two vowels are presented in the graph below:

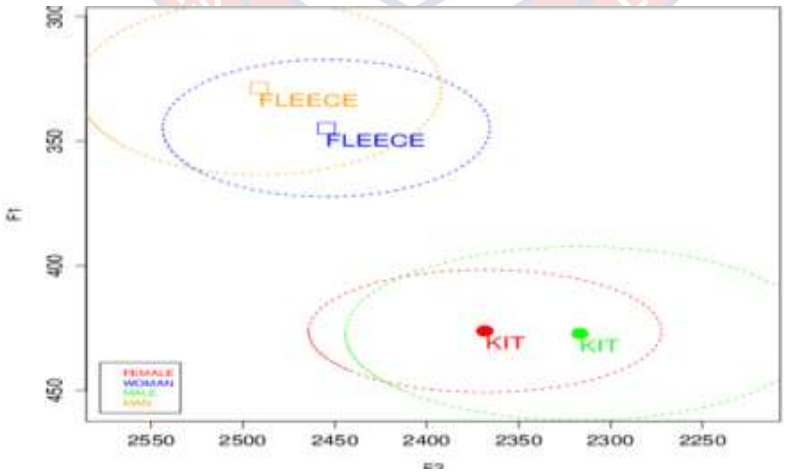


Figure 13: A graph showing the KIT and the FLEECE vowels

Summary of the KIT and the FLEECE Vowels

The summary of the vowels is presented as the overall mean distribution of the three ages under study. These age groups will be discussed alongside the two genders. The first graph is the female mean and the second graph is the mean of the males. The FLEECE vowel is discussed first and the graphs are presented below:

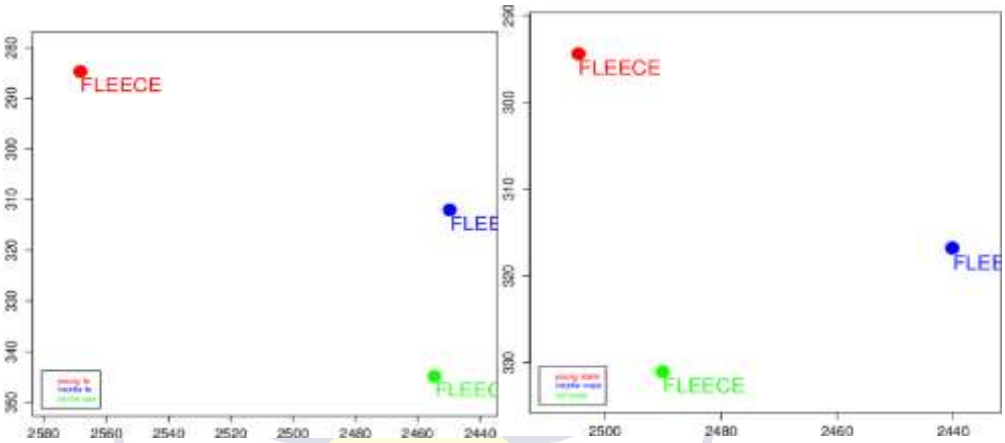


Figure 14: Graphs FLEECE vowels of females (A) and males (B) of the three age groups

The graph shows the mean distribution of the FLEECE vowels as articulated by all the female and male respondents in the study. For identification, the young speakers are represented with the red, the middle age speakers are represented with blue, and the older age groups are represented with green.

For the female respondents, it is evident that the lower age group has a raised and fronted variant of the vowel. The middle age group has a retracted variant of the vowel while the old age group have a lowered and retracted variant of the vowel. For the male speakers, the young age group realized the vowel in approximately the same position as the female speakers. The middle age group had a slightly lowered variant of the vowel as compared to the females. The old age group, however, showed a remarkable variation. They articulated the vowel

in a relatively fronted vowel space which is very different from the retracted variant of their female counterparts.

The KIT vowel will now be discussed. As seen in the earlier discussion, the female graph is presented first, followed by the male graph.

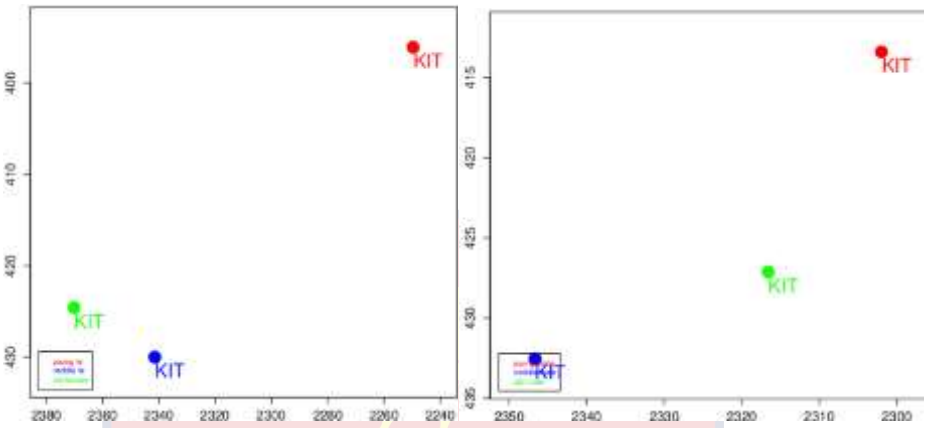


Figure 15: Graphs KIT vowels of females (A) and males (B) of the three age groups

Here, the female young speakers have a raised and retracted variant, the middle age group has the lowest and a central variant of the vowel, with the old age group having a slightly raised and fronted variant of the vowel as compared to the middle age speakers. For the males, the young age group articulated the vowel in a raised and retracted position, very similar to the females. The middle age group, however, had a very lowered and fronted version of the vowel, whereas the old age group had a relatively centralized variant of the vowel.

This presentation is graphically visible but the significant difference cannot be calculated by the graph. Therefore, the next chapter discusses the statistics of the formants to ascertain whether the differences between them are significant or not.

With the discussion of the KIT and the FLEECE vowels now over, I will turn my attention to discussing the DRESS and the NURSE vowels. This will also take the format of the earlier discussion.

Discussion of the DRESS /E/ and the NURSE /ɜ:/ Vowels

The DRESS and the NURSE vowels are discussed together because of the high degree of overlap and similarity that accompanied the articulations. Before I talk about the respective realizations of the vowels, I will first present a scatter plot of all the vowels as they were pronounced by the speakers. This will give a clearer picture of the vowel spaces within which the vowels were uttered. The scatter plot is presented below:

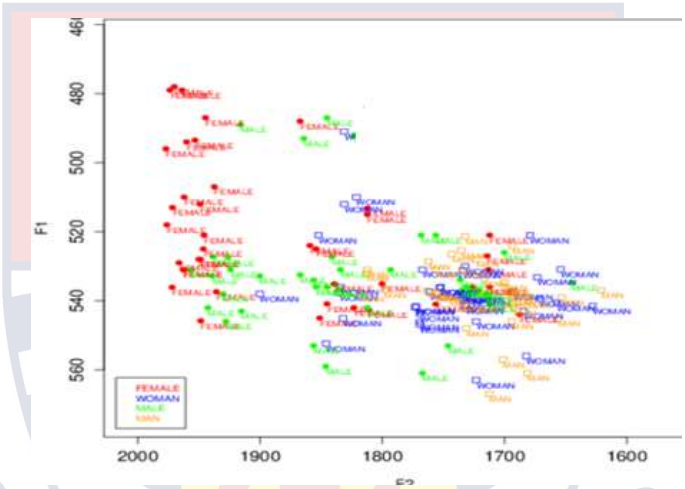


Figure 16: Scatter plot of the DRESS and NURSE vowels as realized by the speakers

For easy identification, the individual vowel sounds were represented in different colors. For the female speakers, I represented the DRESS vowel with red, and the NURSE with blue; the males had green for the DRESS vowel and yellow for the NURSE vowel. This said, I look at the graph above raises issues of concern intriguingly. There are shreds of evidence of variation in the realizations of these vowels, some are surprising while others were expected. A detailed analysis of the individual vowels is done below.

The DRESS /e/ Vowel in the Lowest Age Group

The DRESS vowel showed a high level of variation between the youngest speakers in the study. For a better encompassing discussion, I will present a graph of just the vowel as was spoken by the speakers

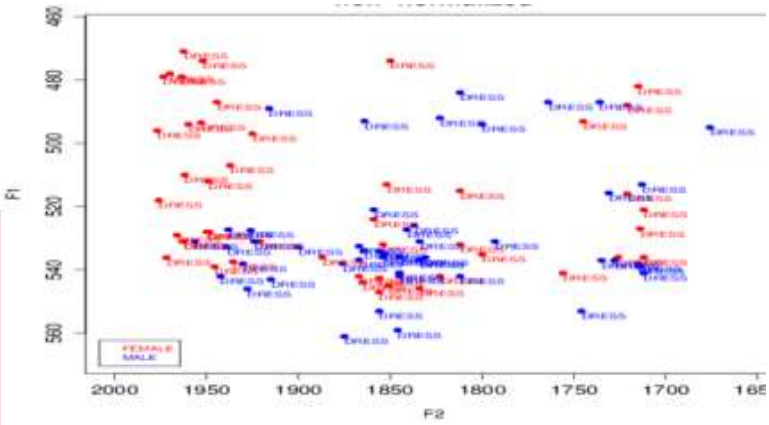


Figure 17: Scatter plot of male and female speakers eliciting the DRESS vowel

From the graph above, there is clear evidence that the DRESS vowel has several variations in the speech of the young speakers. For identification, the red dots in the graph represent the female speakers while the blue dots signify the male speakers. A glance at the graph tells instantly that the vowel has overlapped and adopted certain spaces of other vowels. There is a clear indication that the young female speakers realize a relatively retracted and raised variant of the sound as compared to the males. The analysis also indicates that the DRESS vowel, in general, has been retracted and raised towards the vowel, /ɪ/ with 46 tokens, representing 9% realizing the /e/ as [ɪ] This situation is not very alien to recent phonetics trend. The situation where the /e/ vowel becomes raised and approximated to /ɪ/ is known as the Pin-Pen merger and it was a phenomenon that is identified with Southern American English and other varieties of English. This phenomenon makes the vowels lose their distinction

such that a word like m[ɜ]ntal becomes m[ɪ]ntal (Wells, 1982, cited in Aziaku, 2018). This phenomenon was also present in this study where certain words such as /pet/were rendered /pit/, /head/ as /hid/ among others. This finding is actually in tune with several similar studies. Wells (1982) reports a similar finding in South African English, similar to Maclan and Hay (2004) who witness a similar case in New Zealand English. Recently, in the Ghanaian context, Awoonor-Aziaku (2018) reports a similar occurrence in English spoken by Ewes in the country. This, therefore, can be said to becoming a gradual and established feature of the English spoken in Ghana.

Another observation that was made in the data was the overlap or merge of the vowel /e/ with /ɜ:/. The analysis showed 179 tokens, representing 35% of the /e/ vowel being realized as [ɜ]. This was very frequent as the speakers interchanged these qualities for the vowel. It was, therefore, no surprise when the data recorded pairs such as bed for bird, head for herd, among others. This particular finding has been established in several cultural and contextual studies across the globe (Hawkins & Midgley, 2005; Labov, 1966; Wells, 1982). In the Ghanaian context, studies such as Bobda (2000), Huber (2008), Ankomah (2017), and recently Awoonor-Aziaku (2018) have all reached the same verdict on this particular occurrence. The shift of the DRESS vowel to the center is also becoming the accepted form of the vowel as Harrington, Palethorpe and Watson (2000) reported from a diachronic study of the Queen's speeches that the vowel is gradually being moved. This is no surprise then to see this occurrence frequenting the speech of Ghanaian speakers of English. Again, there were also instances where the DRESS vowels were realized as the lettER [ə] vowel. However, these instances were few, (5 tokens, representing 0.97%) and

therefore I would not wish to make any concrete assertions to that effect. I believe the assertion on whether the speakers have an established case for the realization of the /ə/ vowel as a variant for the /e/ needs more studies and research.

In the discussion of the /e/ vowel by the youngest speakers in my study, I would like to stress here that the females had the highest number of the fronted and raised variant of the vowel while the males had most of their vowels in the centralized position. For the realization of the / ɜ:/ variant, the data suggest that both of the two groups had an approximately equal share, with few instances where the / ɜ:/ variant was raised towards / ə/. To get a defining picture, I will now present a mean distribution as well as the ellipted shot of the individual realizations of the /e/ vowel as uttered by the speakers.

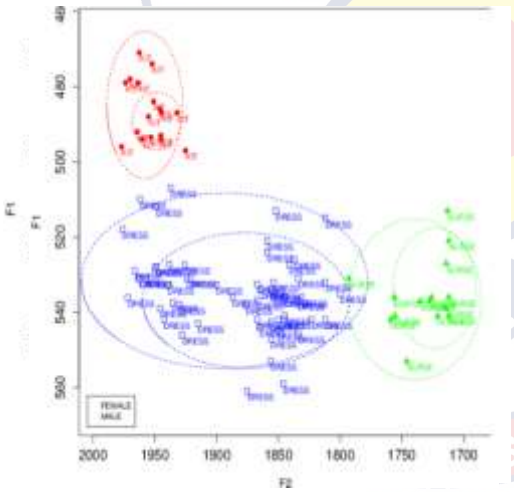


Figure 18: Individual and mean ellipted standard deviation

The plots above tell the graphical picture of what I have explained area. Here, I have presented the individual and the group means of all the variants of the DRESS vowel as was pronounced by the youngest speakers in the study. It is important to note that the sizes of the circle in Fig. 2 represent the quantity and the frequency of the various realizations of the vowel.

The NURSE / ɜ:/ Vowel in the Lowest Age Group

The frequencies of the F1 & F2 frequencies of the individual tokens of the NURSE vowels are plotted on the graph.

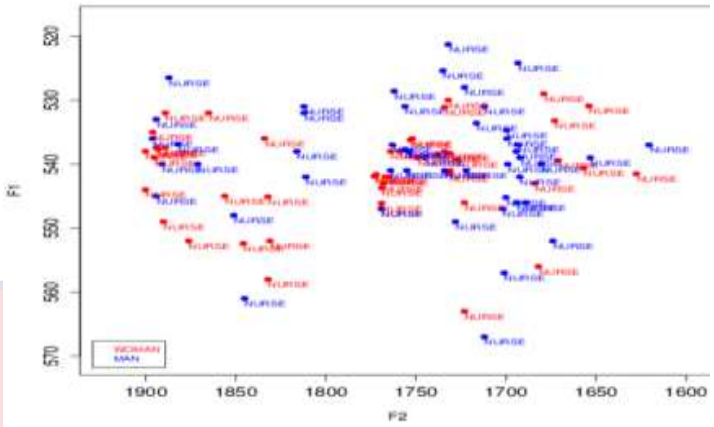


Figure 19: Scatter plot of the individual realizations of the NURSE vowels by the young speakers in the study

The analysis of the formant frequencies of the vowels by the respondents shows that the speakers had varied realizations of the NURSE vowel. It was observed that the younger speakers in the study observed four different variants of the NURSE vowel: the / ɜ:/, /e/, the rhotic variant (/ɜ:ʳ/) (especially with the females) and a slightly raised variant of /ɜ:/ which is closer to /ə/. As discussed in the analysis of the DRESS vowel, these two vowels are generally merged. In most cases, as evident in the graph above, the speakers have merged the vowel spaces of the two vowels under discussion with very little differences as regards their pronunciation and realization.

Another occurrence of the NURSE vowel is that it was very fronted as compared to the 'textbook' description of the vowel. This is evident in the high F2 figures which were recorded for the vowels. The analysis shows that both males and females front the NURSE vowel considerably high in their speech. From the data, 178 tokens, representing 34% were fronted as [e]. This particular

finding is in line with Schmied's (2009) study of South African English and the subsequent discovery of higher F2 figures. This also supports Awoonor-Aziaku's (2018) finding in the English spoken by the Ewes of Ghana. The possible reason for this, as shared by Akpanglo-Nartey (2012), is the influence of the L1s on the speech of the English language. For later studies, it would be imperative to discuss other possible causes of this phenomenon.

Another thing which was observed in the analysis of the speech of the respondents revealed instances of a raised variant of the NURSE vowel. However, these instances were very limited in the occurrence. 26 tokens, representing 5% of the total articulations of this vowel was raised to the mid central vowel [ə]. Another thing that was observed in the analysis was the rhoticism of the vowel, especially by the female speakers. There were instances where 12 tokens, representing 2% of the sounds had this particular feature. This variant, according to Wells (1982), is a very frequent and prominent feature in the variety spoken in England and some parts of the United Kingdom. In this current study, this feature was observed but I believe this is an emerging trend in the language spoken by Ghanaians and I can predict that in the next 5 to 10 years, the younger generation will significantly pioneer the usage in the English spoken in Ghana. In essence, the evidence of this phenomenon is evident in the length distinction of this particular vowel (discussed in the analysis of vowel duration) where the females tended to have longer NURSE vowels than that of the male speakers.

I will now present the ellipted standard deviation of the individual and mean frequencies of the NURSE token as realized by the respondents.

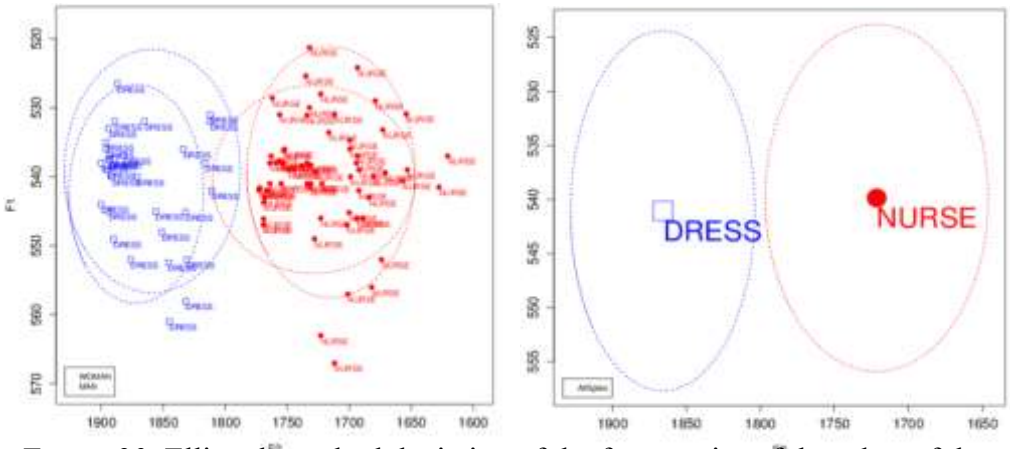


Figure 20: Ellipted standard deviation of the frequencies of the tokes of the NURSE vowel

The graph above demonstrates the significant variations of the NURSE vowels as pronounced by the youngest speakers in the study. This shows that the NURSE vowel was highly fronted by both the male and the female Fante speakers of English in Ghana. The acoustic result of the middle age group will be discussed next.

The DRESS and the NURSE Vowels of the Middle Age Speakers

A scatter plot of the individual tokens of the NURSE vowel as realized by the individuals is presented below:

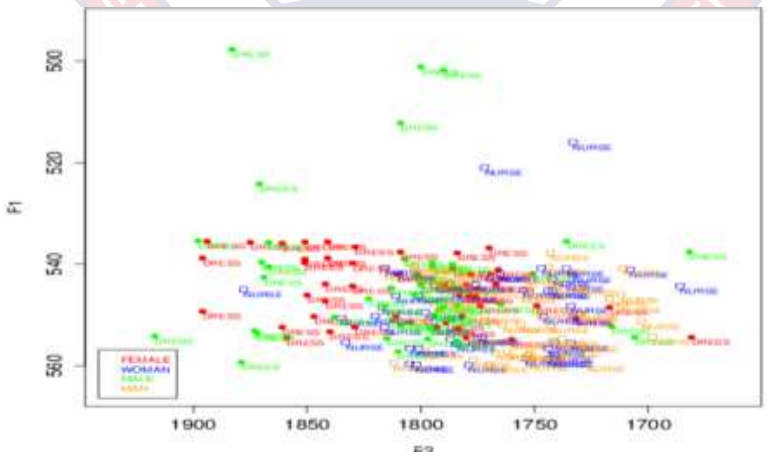


Figure 21: A graph showing the DRESS and the NURSE vowels articulated by the middle age group

The graph above tells the way the individual members of the middle age group appreciated the DRESS and the NURSE vowels. As the map of the plot,

the red dots signify the DRESS rendition by the female speakers while the green dots represent the male speakers. For the NURSE vowel, the female speakers are represented by the blue dots while the males have theirs in yellow. It is also evident from the graph that there were instances where some of the speakers had very high F1 figures for the vowels but these are regarded as errors on the part of the speakers and for that matter, they are not considered for analysis. The area of concentration is in the vowel spaces where the vowels under discussion are situated. A glance at the plots indicates that the speakers merged these two vowels with the highest F2 being 1930Hz and the lowest being 1653Hz. A detailed description of the two vowels is presented below.

The DRESS Vowel of the Middle Age Group

Unlike the earlier group, what we can easily associate with this group in that they do not have variants of the /e/ sound raised to the /ɪ/ vowel. The vowel, however, merges with the NURSE vowel such that we can say that the distinction between them is lost. This is evident in several studies of the vowel inventory of Ghanaian English as Ankomah (2017) and Awoonor-Aziaku (2018) in the English spoken by Ghanaian speakers and Ewe speakers respectively. In this study, this occurrence is proving to be very prominent in the English spoken by the Fantes of Ghana. That said, an individual graph of the vowel as pronounced by the two gender groups will be provided below:

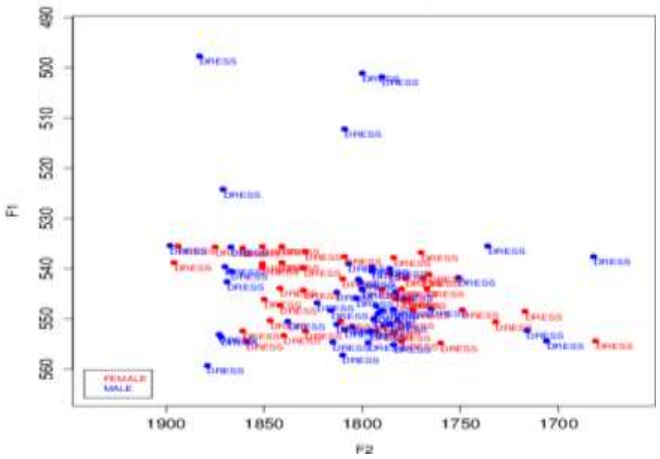


Figure 22: Scatter plot of DRESS vowel by the middle age group

The plot tells us that this group had their vowels realized in a relatively back position, as compared to the first group. It is also evident that this group has their vowels in a much lower position as compared to the earlier group with the F1 ranging between approximately 535Hz to about 560Hz. In addition, it is clear from the graph that the vowel has entered the vowel space of the NURSE vowel to the point that we cannot easily identify the two vowels from each other. Importantly, we can conclude that both genders have the similar vowel space for the vowels. However, this can be better understood in the graph below which shows the mean and ellipted standard deviation of the vowel as pronounced by the two speakers.

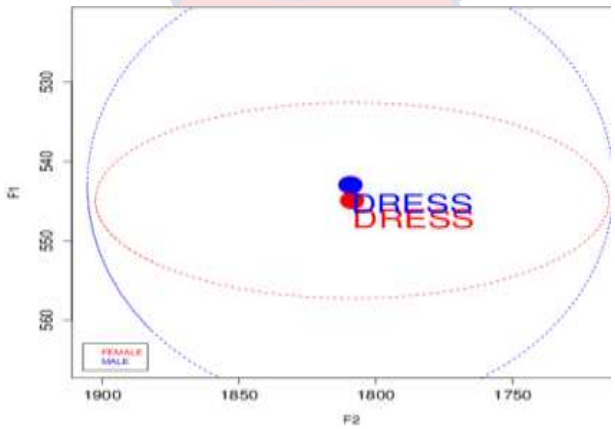


Figure 23: Ellipted standard deviation and mean of the male and female speakers realizing the DRESS vowel

The graph clearly shows that the males and the females did not express any apparent difference in the realization of the vowel under discussion. It also noticeable from the mean demonstration that the two vowels were realized at around 500Hz for the F1 and 1812Hz for the F2, a figure which is lower and more retracted respectively than that of the first.

The NURSE Vowel of the Middle Age Group

A scatter plot of the individual realizations of the NURSE vowel as spoken by the respondents is presented below:

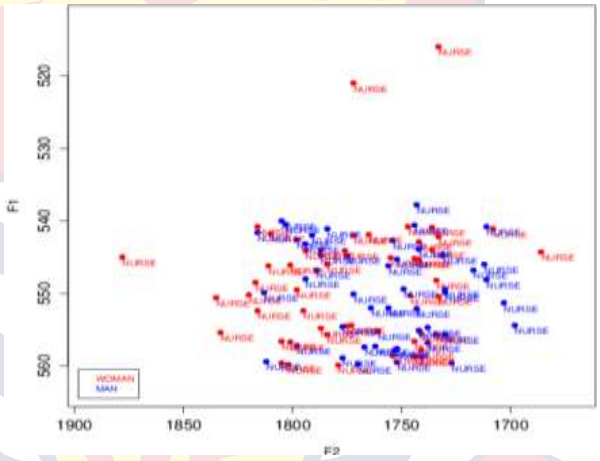


Figure 24: Scatter plot for the individual realization of the NURSE vowel by the speakers

The plot tells us that the speakers in this age group were able to realize the vowels in a fronted vowel space as compared to the textbook description of the RP vowels. Just like the DRESS vowel, we see evidence of some few vowel tokens being raised to the vowel space of the /ə/ sound. I believe this is just an error and that there is nothing significant about it so I will not discuss it here. What is important to the study, however, is that the males and the females realize the vowel in approximately the same vowel spaces, with the females having the more fronted vowels than the males. On the other hand, the males appear to have more of their vowels on the opposite side of the scale. The

fronting of the NURSE vowel in Ghanaian English has recently been reported by Ankomah (2017) and Awoonor-Aziaku (2018) and as it is evident in this investigation of the Fante speakers of English, one can say that it is gradually being established as a key characteristic of Ghanaian English. In this case too, just like with the DRESS vowel, the vowel spaces have overlap to the point that we cannot tell the difference between the two renditions of the variants of the NURSE vowel. However, with the help of the mean standard deviation, we can easily tell if there was a difference in the vowel spaces of the male and female speakers in the realization of this vowel and as such, I present that particular graph below:

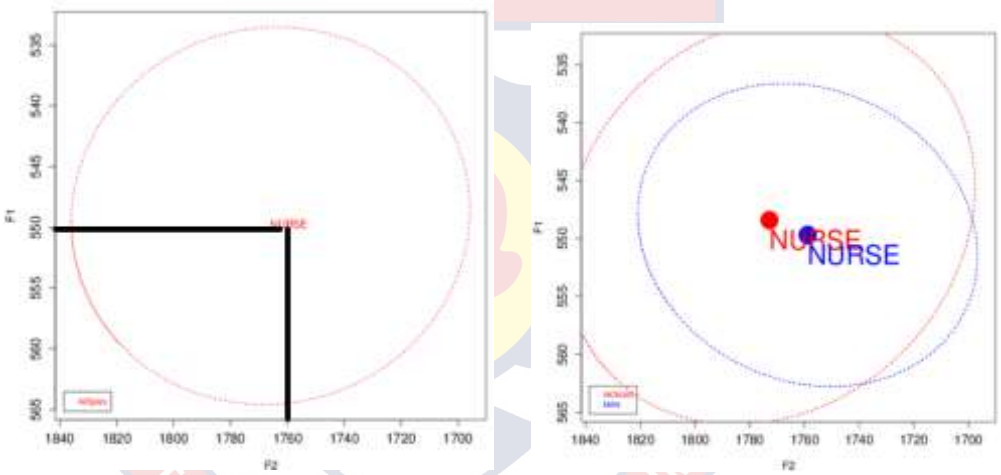


Figure 25: The ellipted mean of the standard deviation of the two speakers and the total mean of all the speakers respectively

Fig. 25 above describes the mean plot for the gender division in the study. We can deduce that the females have a relatively higher and fronted variant of the NURSE vowel as compared to the males. However, in observatory terms, the gap between them is not huge enough but it will be tested statistically (in the next chapter) to ascertain if there are any differences between them. Fig. 2., on the other hand, describes the mean position of the vowel as realized by

the speakers and from the plot we can state that the NURSE vowel has a mean value of 550Hz for the F1 and 1760 for the F2.

In discussing the middle age group in acoustic terms in general, it will be right to say that they do not display very vibrant observatory Intra and inter-speaker differences as regards the acoustic pieces of evidence provided in this discussion. However, for more concrete conclusions, the statistical analysis (which will be discussed in the next chapter) will help give a clearer image. I will now discuss the vowels as realized in the speech of the third group in the study.

The DRESS and the NURSE Vowels in the Older Age Group

The discussion of the DRESS and the NURSE vowels in the earlier groups suggests the possibility of variations in this age group too. To analyze the vowels in detail, I first present a scatter and mean plots of the individual tokens of the two vowels as realized by the respondents in this age group.

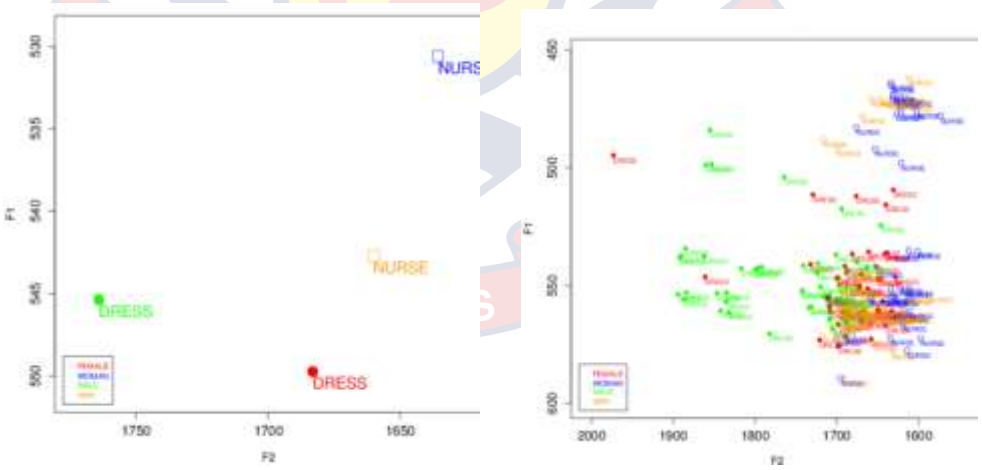


Figure 26: Scatter and mean plots of the DRESS and the NURSE vowels by the Fante speakers of English

The graph presents a very interesting picture of the vowels by the speakers. for the DRESS vowels, the males are represented by the green dots, while the females are represented by the red dots. As regards the NURSE vowel,

the males are signified by the yellow dots whereas the females are signified by the blue dots. The second plot gives a very vivid picture of what is happening in this age group. The detailed analysis of the results is discussed below.

The DRESS Vowel in the Older Age Group

The result of the analysis of the DRESS vowel is presented below

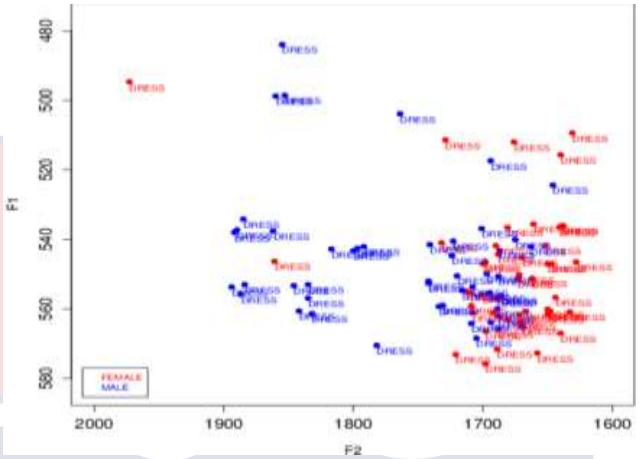


Figure 27: Scatter plot for the DRESS vowel in the older age group

In the graph above, the blue dots represent the male speakers while the red dots represent the female speakers. From the analysis, we get to say that the male speakers in this age category have a more fronted variant of the vowel as compared to the females. However, we also see that both the males and the females have their vowels being articulated in a backward vowel space, intruding, and occupying the space of the NURSE vowel. From the group picture in Fig.25, we get to see that both vowels have completely merged to a point that it is impossible to decipher, in particular, the differences between them. The merge of the DRESS and the NURSE vowels has been a common phenomenon in this study, regardless of the height and the back-front distinctions of the vowels. Thus, per the evidence available to this group, we can state that, acoustically, the males in the third group have a more fronted and slightly raised variant of the DRESS vowel as compared to the females.

Numerically, the males have a mean F1 of 549.7Hz and 1683.1 for the F2 while the females have a mean F1 of 545.4 Hz and F2 of 1764.1Hz. To cap this adequately, I present the speaker means for the two genders below:

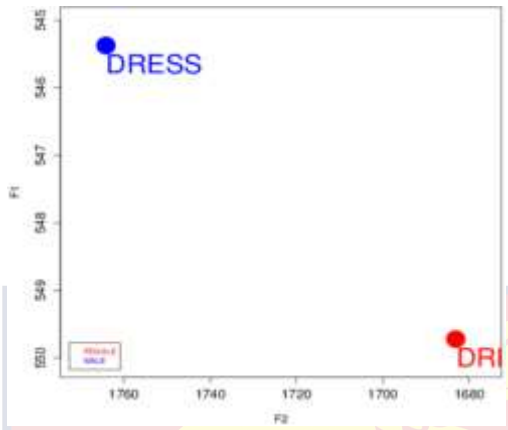


Figure 28: Mean graph of the DRESS vowel by the male and female speakers

The NURSE Vowel in the Older Age Group

The figure below illustrates the vowel tokens of the NURSE vowel by the respondents of the study.

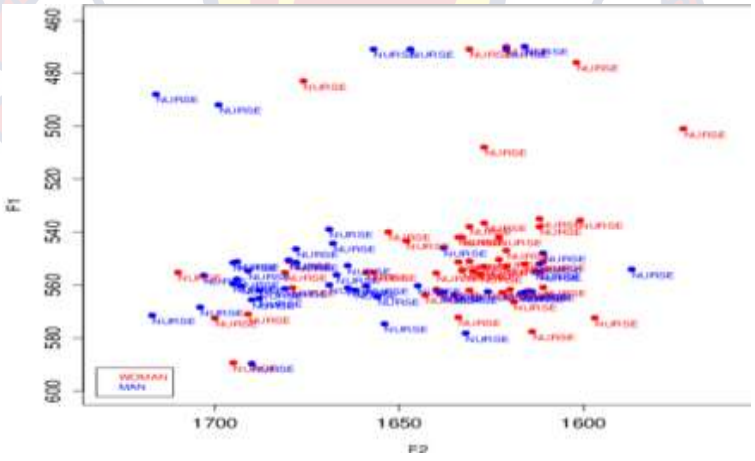


Figure 29: A scatter plot of the NURSE vowels as realized by the speakers

The graph tells that the vowel was realized in relatively retracted vowel space. There is also evidence of some of the vowels being raised to the vowel space of the lettER (schwa) /ə/ vowel. It also appears from the graph that the males had a more fronted rendition of the vowel, just as was for the DRESS

vowel. The variation of the NURSE vowel in Ghanaian speech has also been found to vary considerably (Ankomah, (2017); Awoonor - Aziaku, (2018). In this study, the respondents in the older group realized three variants of the vowel: the DRESS /e/, the NURSE, /ɜ:/, and the lettER (Schwa) /ə/. The merge of the DRESS and the NURSE vowels generally in global varieties as well as particularly in Ghanaian English has been well documented earlier in this study. Statistically, this study recorded 382 tokens of the NURSE vowels being realized as [e] vowel. The schwa vowel, on the other hand, was realized in some cases in the speech of the older respondents in the study. The study shows 62 tokens (12%0 of the NURSE vowels were articulated as [ə] vowel. Invariably, it has been described to be very viable in the English language and other languages where its realization is a result of an upshot of nullification of vowel quality contrasts (Flemming, 2007). In these instances, most of the vowels became unstressed during their pronunciations and reduced in length and quality.

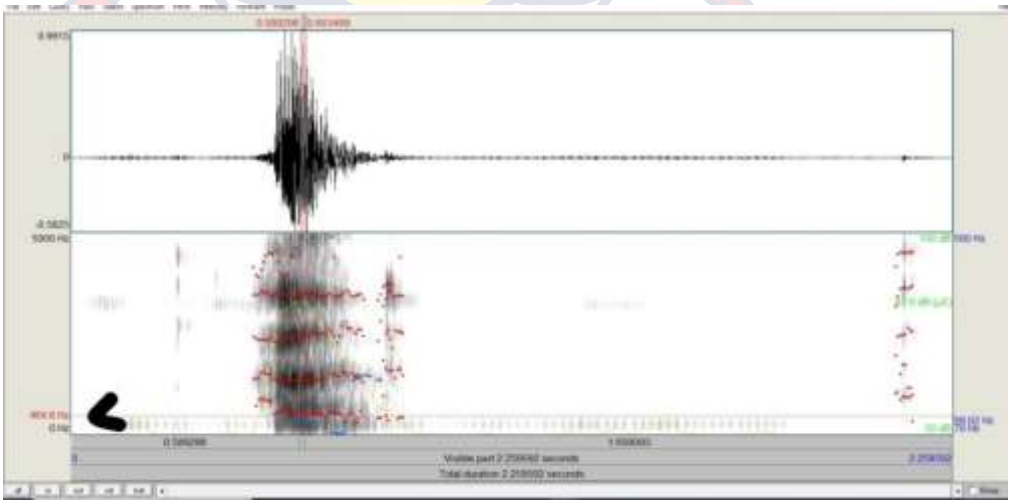


Figure 30: A spectrogram of KW producing /hɜ:d/

In the spectrogram above, speaker KW was originally producing /hɜ:d/ but ended up producing /həd/ with the vowel becoming reduced and unstressed. This phenomenon was present in almost all the data samples but I did not talk

about them because they were very few, in some instances even none. The reason I classified this is that the occurrences, although not many, are quite observable and clearer than as present in the other groups and speakers. The black arrow in the spectrogram points to the numeric figure (F1) of the vowel, which is very high in this context, 468Hz. A presentation of the variants of the NURSE vowel as described in this section is offered on the graph below:

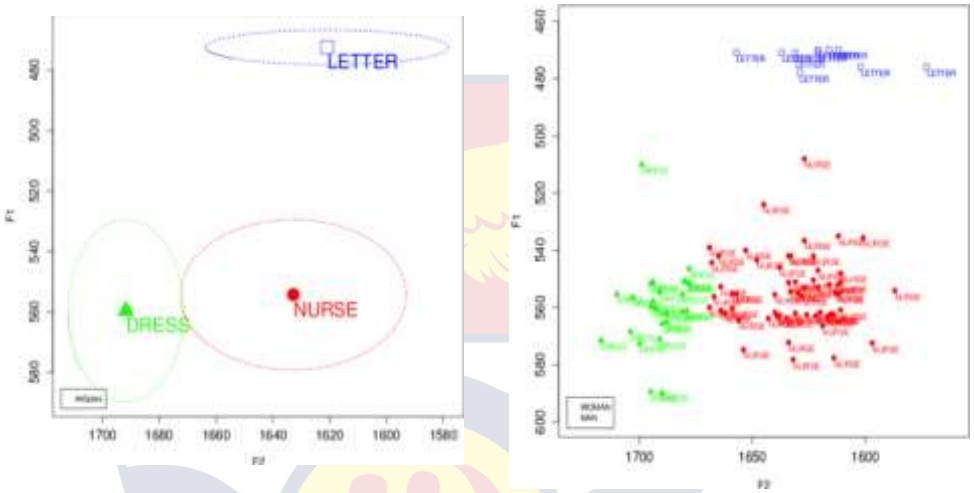


Figure 31: The individual and the mean ellipted separation of the variants of the NURSE vowel

The analysis presents an unanticipated discovery in the speech of the older Fante speakers of English in Ghana. However, this phenomenon has been recorded in varieties of English around the world, significantly, Herrick (2003) in the study of the English of Girona and Catalan; and Padgett & Tabain (2003) in their study of Standard Russian English. In Ghana, it confirms the earlier findings of Lomotey (2010), Ankomah (2017), and Awoonor-Aziaku (2018) that Ghanaians use the schwa vowel in their speeches. This finding also contradicts the findings of earlier scholars such as Huber (2008), on the existence of the schwa in Ghanaian English and subsequently goes ahead to buttress the point that the impressionistic approach to analyzing speech has so many concerns and deficiencies.

Summary of the DRESS and the NURSE Vowels

The summary of the vowels is presented as the overall mean distribution of the three ages under study. These age groups will be discussed alongside the two genders. The first graph is the female mean and the second graph is the mean of the males. The DRESS vowel is discussed first and the graphs are presented below:

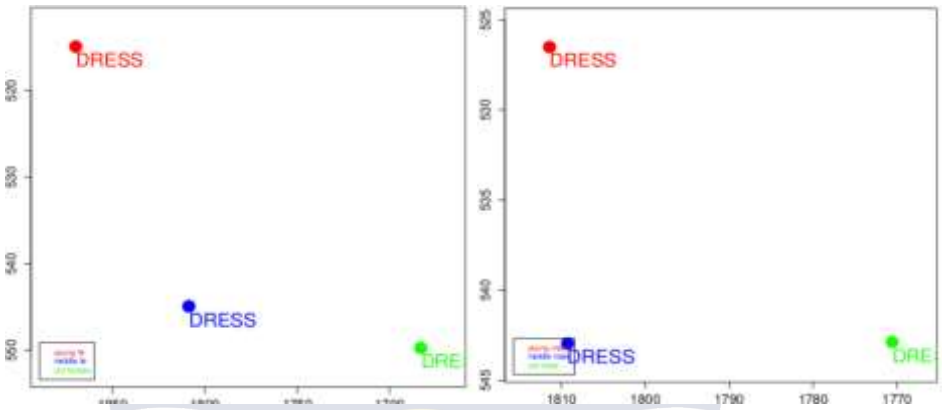


Figure 32: Graphs DRESS vowels of females (A) and males (B) of the three age groups

For the female speakers, the young age group have a raised and fronted variant of the vowel, the middle age group have a lowered variant and a relatively centralised variant, with the old age group having the lowest and the most retracted variant. On the part of the male speakers, they have a variant similar to the females but a slightly higher variant. The middle age group and the old age group have the same lowered variant with the middle age group having a fronted variant and the old age group having a retracted variant of the vowel.

The discussion of the NURSE vowel is next and the mean graphs are presented below:

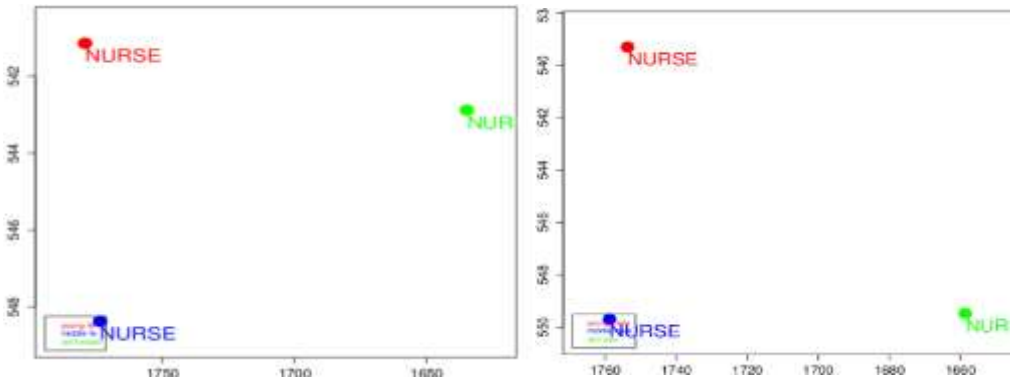


Figure 33: Graphs NURSE vowels of females (A) and males (B) of the three age groups

For the female speakers, the young age group has a raised and a slightly fronted variant of the vowel, the middle age group has the lowest variant and slightly fronted as well. The old age group, on the other hand, has a relatively retracted variant, with the vowel moving more into the back vowel spaces. For the males, the young age group has a similar position as the females, the middle age group also have a similar position as the females just that the vowel is the most fronted of all the groups. The old age group has a very retracted position but unlike the females, the males have a very lowered variant of the vowel.

These presentations are graphically visible but the significant difference cannot be calculated by the graph. Therefore, the next chapter discusses the statistics of the formants to ascertain whether the differences between them are significant or not.

Summary of Chapter

This chapter has discussed, strictly, the acoustic findings of the current study to other similar and significant studies. We have learned that the respective age groups have their distinct ways of producing the vowels understudy both intra and inter speakers. After this detailing, I will now turn my attention to do a more comparative analysis of these vowels by using both

acoustic and statistical analysis to present more solid and concrete differences between the gender and the age groups in this current study. The aforementioned analysis will be done in the next chapter.

CHAPTER FIVE

COMPARATIVE AND STATISTICAL ANALYSIS

This section of the analysis answers the second and the third research questions that guided the study. The second research question is answered first and then the third follows.

In answering the second research question, the data for the study was coded and using SPSS for the statistical difference and comparison. Meaning that all the individual variants that were realized by the speakers were coded and assigned numerical values to transform them into measurable and quantitative data

Two statistical tests, (an independent sample t-test and an analysis of variance (ANOVA)) were used to find out statistical inferences between and among the different groups. The t-test was set to find out statistical differences between the two independent groups while the ANOVA was used to test the statistical differences within the same age group and the three separate age groups as well as their social relations. Both methods made it possible to calculate the margin of difference (effect size) between the two gender groups and the three age groups via Eta Square statistics. For the T-Test, a $P<0.05$ (5% significant level) was set as the cut-off point for the P-value. The P-value was reported as 'significant' or 'very' significant depending on how close to zero the value was. If the P-value was very close to or less than 0 it was reported as highly significant and was an indication that the observed differences were unlikely to be due to chance. But if the value was greater than or above 0.05 ($P>0.05$), it suggested an insignificant or no differences between the groups and was an indication that the difference was likely to be due to chance.

For the ANOVA test, three P-values were set to test significance because the figures were very close and as a result, this was done for the difference to be reported adequately. I tested significance at 1% (P<0.01), 5% (P<0.05), and 10% (P<0.10). After this analysis, I reported the varied difference using asterisks to indicate the degree of significant difference. A single asterisk attached to a figure means that a particular group showed a very high significant difference at 1%. Two asterisks represent a 5% significant difference with three asterisks relating to a 10% significant difference between the subjects.

The tests were applied within and between the different age groups and then to gender. In the next few sections, I discuss the results of the statistical analysis. This analysis is done side by side with the acoustic mean description of the vowels of the speakers.

Means of Vowels by Gender

The first thing to talk about here is the cumulative difference between the male and female speakers. In doing this analysis, a sample t-test was conducted on the individual realizations of the respective vowels for the two genders under study. The result of the analysis is presented in the table below:

Table 2: Differences in means of Vowels between females and males (t-test)

Vowels	Female (N=24)		Male (N=24)			Significance
	Mean	**St. Dev.**	**Mean**	**St. Dev.**	t value	Pr > t
Dress	1161.856	35.836	1167.272	17.025	-0.572	0.566
Fleece	1402.475	28.086	1398.978	27.120	0.380	0.706
Kit	1317.947	36.647	1372.908	18.060	-0.515	0.609
Nurse	1136.689	8.476	1134.056	5.869	0.255	0.800

Source; Fieldwork 2018

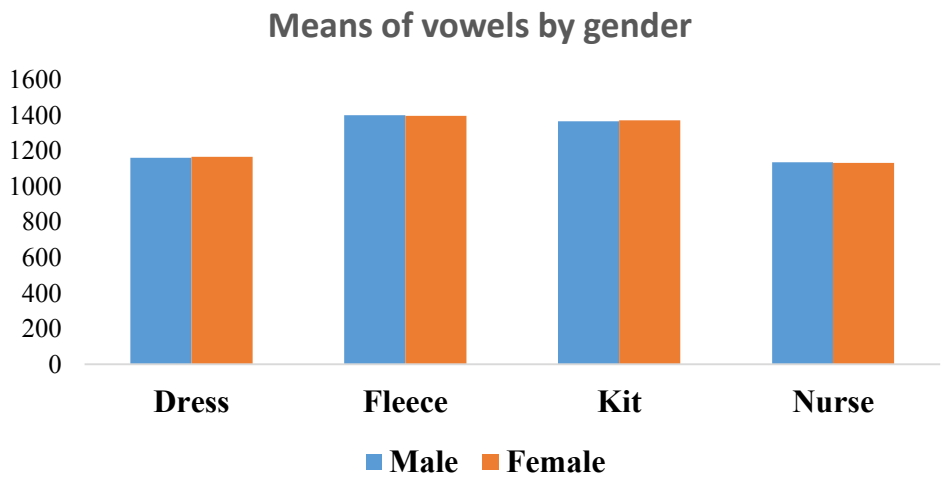


Figure 34: Differences in means of Vowels between females and males
Source: Fieldwork 2018

From the table (2), all the vowels show differences in the total mean values of the vowels but these differences are not statistically significant. This means that across the two genders understudy, the means of their formants are not significantly different. What is important to note that although the individual age-gender groups may show variation, their cumulative mean frequency neutralizes all the significant differences between them and therefore places them in a place where there are nominal differences in their means but the means do not result in any significant differences. This is because when the individual formants were analyzed independently, the only vowels which showed statistical differences were the F1 of the NURSE vowel (significant at 1%) and the F2 of the FLEECE (significant at 1%). This explains why most of the overall differences were neutralized. I will now talk about the differences across and between the age groups and this presented in table 3 below:

Analysis of the Vowels According to Age

In this section, the statistical analysis of the vowels across the three different age groups is discussed. The vowels are discussed independently and then a general discussion is given.

Table 3: Differences in means across and between age groups (ANOVA)

Vowels	Young (N=16)		Middle (N=16)		Old (N=16)			
	Mean	t. Dev.	Mean	t. Dev.	Mean	t. Dev.	**value**	**Sig Pr > F**
Dress	1180.67[b]***	18.16	1176.425	12.02	1136.59[c]***	26.30	18.26	0.000
Fleece	1413.46	30.95	1379.800[a]***	15.53	1408.92[c]***	20.95	7.33	0.002
Kit	1338.667[b]***	20.28	1388.629[a]***	9.46	1383.98	20.89	29.26	0.000
Nurse	1152.592[b]***	14.33	1157.604	8.68	1095.92[c]***	11.03	104.99	0.000

Source: Fieldwork 2018

Notes

a = Middle vs. Young * significant at 10%

b = Old vs. Young ** significant at 5%

c = Old vs. Middle *** significant at 1%

To test the differences between and across the age group, a three-way ANOVA was conducted to document it. The breakdown of the table is presented as thus; For the DRESS vowel, it was seen that there was a significant difference recorded in the mean values between the old speakers and the young speakers at 1% significant value, which means the difference between the two was highly significant. No significant difference was recorded between the young and the old speakers for this particular vowel though there was a difference in the nominal mean values of the vowels. These differences were however not significant to be recorded. However, the old and the middle-aged speakers recorded a significant difference at 1% significant value. This also means that there was a highly significant difference between the old speakers and the middle speakers.

The next vowel to discuss is the FLEECE. From the analysis, no significant difference was recorded for the young speakers and the old speakers for the FLEECE vowel. Their mean values showed a difference but this difference was not statistically significant. There was, however, a statistically significant difference between the young speakers and the middle-aged speakers at 1% significant value. This means that the difference between them was statistically very high. Further, there was also a very high statistical difference between the middle-aged speakers and the old speakers of the study. At a 1% significant value, the vowels showed a high statistical difference between the two groups.

Moving on, the KIT vowel witnessed a statistically significant difference between the young speakers and the old speakers at a 1% significant value. This shows a very high statistically significant difference between them. There was, however, no significant difference between the middle-aged speakers and the young speakers although their means showed a difference in number. There was, however, a statistically significant difference at a 1% value between the middle-aged speakers and the old speakers of the study.

Finally, for the NURSE vowel, the data did not show any statistically significant difference between young speakers and middle-aged speakers of the study although their means showed a statistical difference.

Statistically significant differences were however recorded between the old speakers and the young speakers and the middle-aged speakers and the old speakers at a 1% significant value each.

Discussion

From the analysis above, we get to understand that, for the three age groups under study, there were very little significant differences between how the young and the middle-aged speakers pronounced their vowels. I consider this to mean that the change and the difference between the young and the middle ages are steadily gradual. Most of the young speakers are slowly departing from the middle ages and at the same time, most of those in the middle age group is also learning a few things which are present in the language of the young age group. This means that the middle age members are also susceptible to change and in this situation, some of them are truly undergoing the change with the young age group.

There were however higher instances of statistical difference between the young speakers and the old speakers and the between the middle-aged speakers and the old speakers. From the earlier discussion, it is evident that the gap between the old and the young age group is simply not a historical situation but also the susceptibility of change. There is no denying the fact that the old age group can be said to represent the older variety of the language that was spoken. However, the difference between the old and the young can be equated to the desire to change. I believe most of the older generation believe that the variety of the language they speak is the purest because of the emotional attachment they have to it and therefore do not see any reason to try to change their language. Further, the issue may not just be a matter of appropriateness and emotion but can truly mean that the older generation is now leaving or has left the active work circles and therefore they are reconciled to just maintain the

language they have always possessed. They do not see the need to change how they speak to accommodate modern trends of language.

The analysis of the age groups is then presented in the graph below:

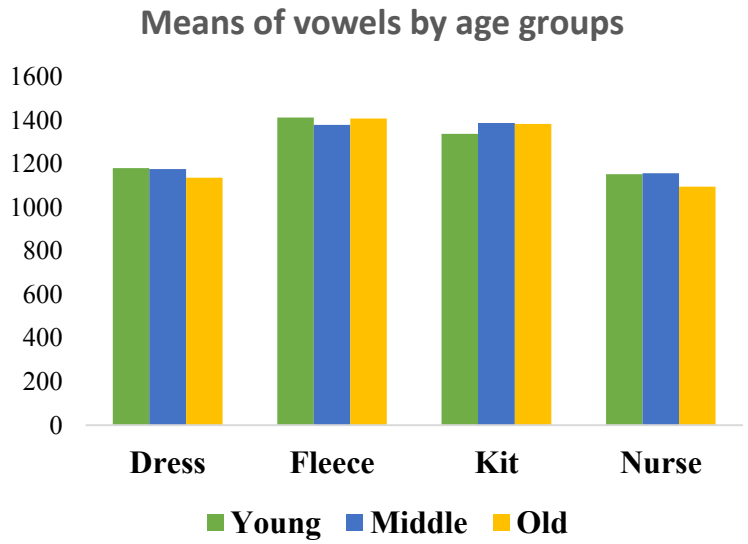


Figure 35: Differences in means across age groups (ANOVA)
Source: Fieldwork 20

I will now discuss the difference in the vowels as articulated by the males and females individually. The first to discuss here is the female speakers and the discussion will follow the format of the one above.

Analysis of the Female Speakers Across Age

This section of the analysis focuses on just the female speakers and the statistical differences between them. A discussion of the variation between the age groups of the females is presented below.

Table 4: Differences in means across and between age groups (ANOVA) among females only

Vowels	Young Females (N=8)		Middle Females (N=8)		Old Females (N=8)		value	Sig PPr > F
	Mean	St. Dev.	Mean	St. Dev.	Mean			
Dress	1192.39[b]***	16.22	1176.74[a]**	6.66	1116.43[c]***	14.08	57.25	0.000
Fleece	1426.51[b]*	31.80	1381.14[a]***	16.57	1399.76[c]	12.13	6.53	0.010
Kit	1320.05 [b]***	6.27	1387.67 [a]***	13.38	1396.12[c]	13.24	79.42	0.000
Nurse	1160.21[b]***	11.47	1160.95[a]	6.27	1088.90[c]***	10.75	107.56	0.000

Source: Fieldwork 2018

Notes

a = Middle vs. Young * significant at 10%

b = Old vs. Young ** significant at 5%

c = Old vs. Middle *** significant at 1%

The statistical breakdown of the means of the female speakers in the study is presented here. Since I was looking at the difference between and among three separate groups, a three-way ANOVA test was used for the analysis. The results presented in the table are discussed here.

From the table (4), we see that there was a significant difference between the young speakers and the old speakers in the study. The difference was high because it was calculated at a 1% significant value. There was also a significant difference between the young speakers and the middle age speakers at a 10% significant value. This means that the difference between the two groups is significant but not as strong as the earlier one. Finally, significance was again found between the middle-aged speakers and the old speakers of the study at a 1% significant value. This means that with the female speakers under study, there was variation between all the groups. That is, the DRESS vowel varies between the Fante female speakers of English.

Concerning the FLEECE vowel, there was a statistically significant difference between the young and the middle-aged speakers at a 10% significant level. This means that the difference is significant but not very strong. There

was also a difference between the young and the middle-aged speakers at a 1% significance level and this correlates a stronger significant difference between the two groups. There was however no statistically significant difference between the middle speakers and the old speakers although their means showed a nominal or a difference in value.

With the KIT vowel, there was a highly significant difference between the old and the young speakers and the young and the middle-aged speakers at 1% significant value each. The middle age and the old age saw a difference in their mean values but this was not statistically significant for analysis.

Finally, it can be seen that the NURSE vowel shows a statistically significant difference between the young and the old speakers and the middle and the old speakers both at a 1% significant difference each. There was, however, no statistically significant difference between the young and the middle-aged speakers although there was a statistical difference between the nominal mean figures.

Here too, I present the representation of the analysis in the graph below

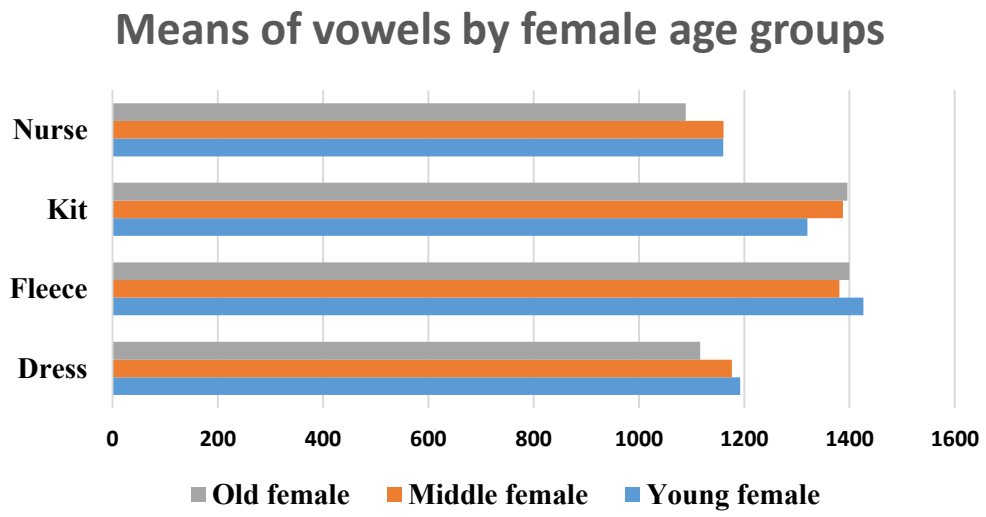


Figure 36: Differences in means across age groups among females only
Source: Fieldwork 2018

Analysis of the Male Speakers Across Age

Like the former section, this section focuses on the statistical analysis between the male speakers across the three age groups.

Table 5: Differences in means across and between age groups (ANOVA) among males only

Vowels	Young (N=8)		Middle (N=8)		Old (N=8)		**F value**	**sig pr > F**
	Mean	St. Dev.	Mean	St. Dev.	Mean			
Dress	1168.96[b]	11.56	1176.11[a]	16.52	1156.74[c]*	18.67	2.29	0.1360
Fleece	1400.40[b]	26.22	1378.45[a]	15.85	1418.06[c]***	24.84	4.56	0.028
Kit	1357.28[b]*	5.81	1389.58[a]***	3.98	1371.85[c]**	20.78	9.79	0.001
Nurse	1144.98[b]***	13.44	1154.25[a]	9.97	1102.94[c]***	5.81	42.86	0.000

Source: Fieldwork 2018

Notes

a = Middle vs. Young * significant at 10%

b = Old vs. Young ** significant at 5%

c = Old vs. Middle *** significant at 1%

Let us now talk about the statistical relationships between the males across the three age groups. It is evident from the table that there was no significant statistical difference between the young and the old speakers on one hand and the middle-aged speakers and the young speakers on another hand although their means showed a numerical difference. These differences were not significant to report. For the middle-aged speakers and the old speakers, their means recorded a significant difference between the realization of the vowel at a significant value of 10%. This means that although there is a significant difference, the difference is not as huge as the earlier reported ones.

For the FLEECE vowel, there was also not a significant statistical difference between the middle-aged speakers and the young speakers and between the young speakers and the old speakers. There was, however, a significant difference between the middle-aged speakers and the old speakers at

a significant value of 1%. This tells that the difference between the two was significantly huge.

The KIT vowel reported significant differences at every level. For the young and the old speakers, there was a statistically significant difference at a 10% significant value. This shows that the difference was significant but not very huge. For the middle-aged speakers and the old speakers, I recorded a significant value at 5% significant level and for the young speakers and the middle-aged speakers, there was a significant difference at 1% which shows an obviously high level of difference between the two sets of speakers.

With the NURSE vowel, there was no statistically significant difference between the young speakers and the middle-aged speakers in the study. The significant differences between the young speakers and the old speakers and between the middle-aged speakers and the old speakers both at 1% significant values. This shows a high level of variance between how the two groups realized the vowel under discussion.

For these statistics, the graphical below illustrate what has been explained above.

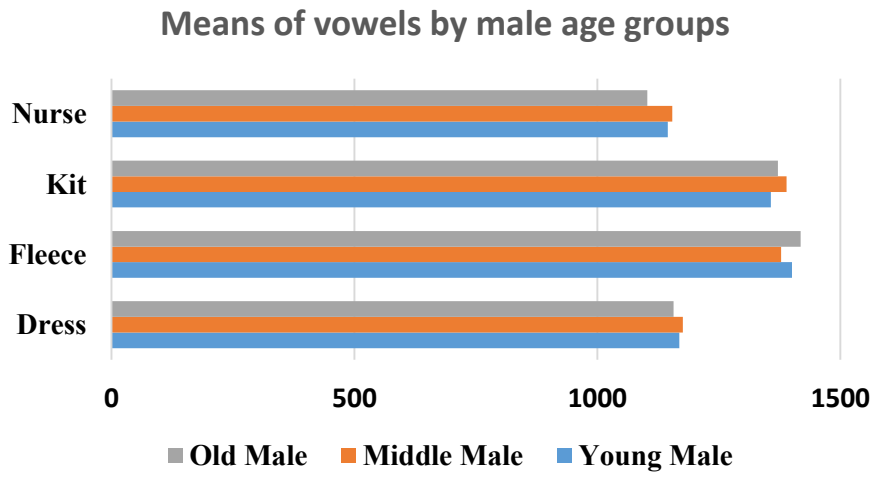


Figure 37: Differences in means across and between age groups (ANOVA) among males only
Source: Fieldwork 2018

Discussion of the Individual Vowels According to Age and Gender

In the paragraphs that follow, the individual vowels under study will be discussed according to age and gender. In doing this, each vowel will be discussed according to the variables listed above with a detailed description of their characteristics using tables, graphs, and explanations. The DRESS vowel will be discussed first and then the rest will follow.

Discussion of the DRESS Vowel by Age and Gender

Here, the DRESS vowel is discussed in detail.

Table 6: Differences in means of Dress vowels across age groups by gender

Age groups	Female (N=24) Mean	St. Dev.	Male (N=24) Mean	St. Dev.	t value	Sig Pr > t
Young	1192.392	16.220	1168.967	11.557	2.881**	0.016
Middle	1176.742	6.663	1176.108	16.524	0.087	0.932
Old	1116.433	14.0812	1156.742	18.673	-4.222***	0.001

Source; Fieldwork 2018
Notes:
* = significant at 10%
** = significant at 5%
*** = significant at 1%

A breakdown of the statistics is presented as thus; From the table, it can be seen that the differences between these vowels were placed at three separate significant values (1%, 5%, and 10%). These are the benchmarks for all the analysis in this section. For the young speakers in the study, there was a 5% significant difference between the males and the females in the realization of the DRESS vowel. This shows a relatively high level of variance between the two genders in the realization of the DRESS vowel. I conducted an independent sample t-test between the males and females for the young group to ascertain the extent of the internal variation. After the test, I realized that there was a significant difference at 1% in both the F1 and the F2 of the speakers. This explains why there were obvious differences in the position of the vowels as seen in the experiment acoustic description earlier.

The next point to talk about is the middle-aged group and surprisingly, there was no statistically significant difference between the middle-aged group. That is, gender did not really affect how the males and female Fante speakers

of English pronounced the DRESS vowel. Here too, the t-test did not show any significant difference in the two formants. Finally, for the old group, there was a very high significant difference (at 1% significance) between the males and the females. For the old age group, the F1 recorded a significant difference at 5% significant level, describing the actual difference. The F2 sowed high variation because there was a significant difference at 1% significant value. This means that among the three age groups under discussion for this vowel, the old group showed the highest variation and then they followed by the young speakers but the middle-aged group did not report any statistically significant difference. This is seen by the graphical representation of the outcome on the graph below.

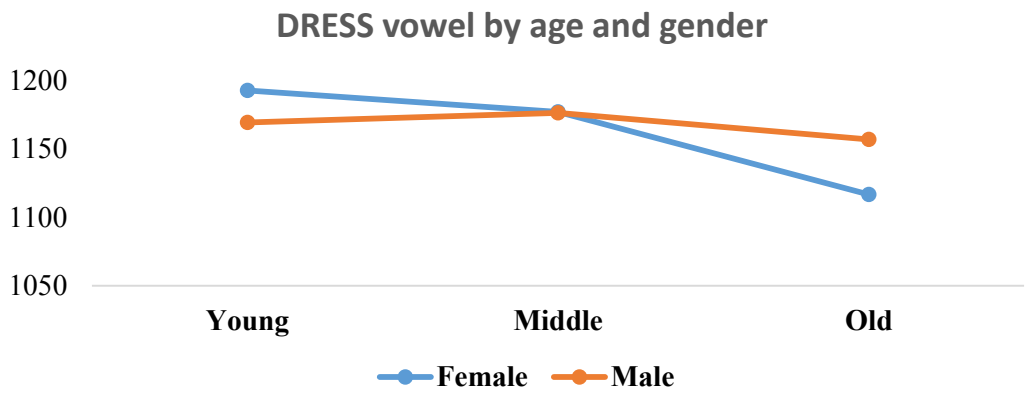


Figure 38: Differences in means of Dress vowels across age groups by gender
Source: Fieldwork 2018

Discussion of the FLEECE Vowel by Age and Gender

The next vowel to talk about is the FLEECE vowel and the statistical results of this vowel are presented below:

Table 7: Differences in means of FLEECE vowels across age groups by gender

Age	Female (N=24)		Male (N=24)		t value	Sig
groups	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		Pr > t
Young	1426.517	31.803	1400.408	26.220	1.551	0.151
Middle	1381.142	16.576	1378.458	15.849	0.286	0.780
Old	1399.767	12.134	1418.067	24.842	-1.621	0.136

Source: Fieldwork 2018
Notes:
* = significant at 10%
** = significant at 5%
*** = significant at 1%

Surprisingly, there were no significant differences between all the three age groups for this vowel although there were statistical differences between their mean values. What this means is that the FLEECE vowel shows very little if any, the difference in pronunciation among males and females across the three age groups of Fante speakers of English used for this study. The t-test conducted between the respective genders and the ages did not show any significant difference in formants.

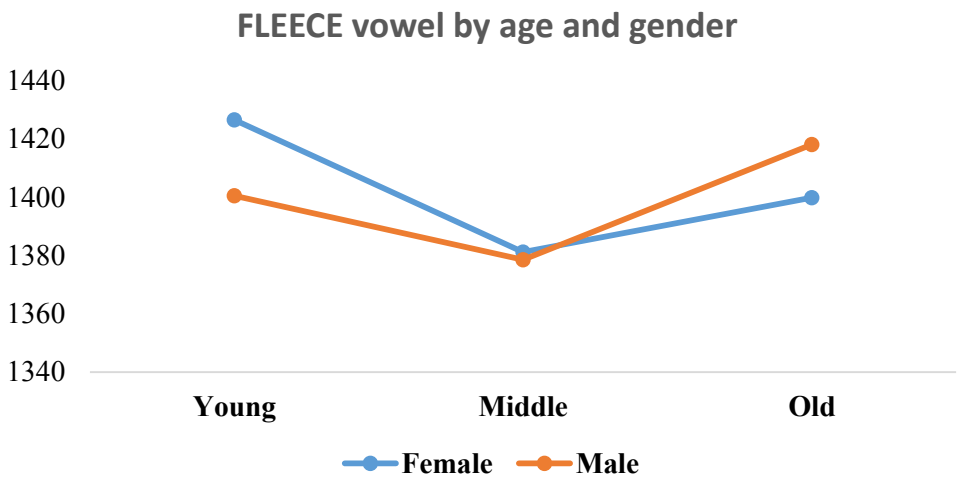


Figure 39: Differences in means of Fleece vowels across age groups by gender
Source: Fieldwork 2018

Discussion of the KIT Vowel by Age and Gender

The next vowel to talk about is the KIT vowel and the results of the statistical test are presented below

Table 8: Differences in means of KIT vowels across age groups by gender

Age	Female (N=24)		Male (N=24)		t value	Sig
groups	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**		Pr > t
Young	1320.05	6.27	1357.283	5.808	-10.666***	0.000
Middle	1387.675	13.38	1389.583	3.967	-0.334	0.744
Old	1396.117	13.24	1371.858	20.775	2.411**	0.036

Source; Fieldwork 2018

Notes:
* = significant at 10%
** = significant at 5%
*** = significant at 1%

From the table, we can see that there is a significant difference between the young speakers of the study. The t-test conducted shows that there was a very high significant difference (at 1% significant value) between the males and the females in their realization of the KIT vowel. This is as seen in the experiment in the first section of the analysis where the females showed a more retracted and highly approximated (to the RP) realization of the vowel as compared to the males and the entire respondents for that matter. In essence, the respective formants showed remarkable differences. The FI of the males and the females showed a significant value at 1%, similarly with the F2. This shows why the females had a more fronted version of the vowel as seen in the experiment. It also explains why the females had the KIT vowel in a lowered position as relative to the males' rendition.

Surprisingly, the middle-aged speakers did not report any significant statistical difference in their realization of the vowel. There was however a

significant difference between the old speakers. Here, the analysis recorded a 5% significant value difference between the males and the females in this age group. The independent analysis between them shows no significant difference between the F1 but there was a significant difference of 5% between the F2 of the males and the females. From this analysis, what we can say is that the KIT vowel shows a lot of variance between the three age groups. The variation is mostly seen between the young speakers and the old speakers while surprisingly, the middle-aged speakers do not exhibit any statistically significant differences.

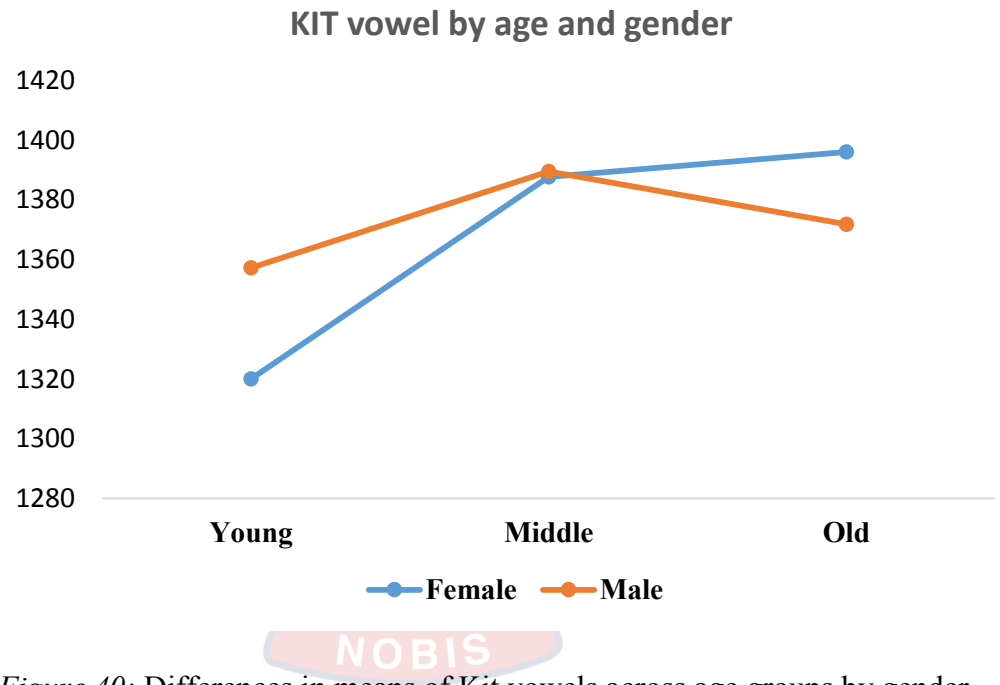


Figure 40: Differences in means of Kit vowels across age groups by gender
Source: Fieldwork 2018

Discussion of the NURSE Vowel by Age and Gender

I will now turn my attention to talk about the NURSE vowel and the statistical results are presented in the table below

Table 9: Differences in means of NURSE Vowels across age groups by gender

Age groups	Female (N=24)		Male (N=24)		t value	Sig
	Mean	**St. Dev.**	**Mean**	**St. Dev.**		Pr > t
Young	1160.217	11.4750	1144.967	13.440	2.114*	0.061
Middle	1160.95	6.271	1154.258	9.976	1.391	0.194
Old	1088.9	10.754	1102.942	5.812	-2.814**	0.018

Source; Fieldwork 2018

Notes:

* = significant at 10%

** = significant at 5%

*** = significant at 1%

From the analysis in the table (9), we see that there was a statistically significant difference between the young speakers in the study. The males and the females saw a significant value of 10% in the pronunciation of the NURSE vowel. This difference, however significant, is not very huge. Interestingly, the middle-aged speakers did not record any statistically significant difference between them. It is very similar to the other findings from the other vowels. It is gradually lending itself to the fact that the middle-aged speakers do not exhibit any serious statistical variations within the manner they pronounce the vowels. Finally, the analysis shows a statistically significant difference in the old speakers where the statistics report a 5% significant level of difference between the males and the females. The analysis here also shows that variation exists in the vowels of the different age genders under study, except for the middle-aged group who rather shows interestingly similar figures and therefore does not propel a level of significance between them. The graphical representation of the results is presented below:

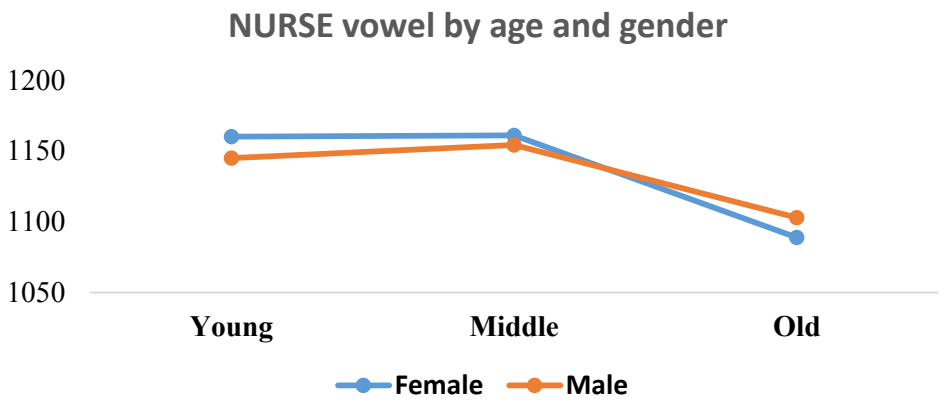


Figure 41: Differences in means of Nurse Vowels across age groups by gender
Source: Fieldwork 2018

Discussion

From the analysis above, it is evident that the distinctive groups of Fante speakers categorized in this research, though homonymous, have some differences between them but the differences between them are not very engulfing. The statistical test indicates that the three age groups under discussion converge and diverge on the distinct vowels which I studied here. What is important to note from here, however, is that the respondents in question are homogenous as regards their geography and the kind of contact languages as well as their native languages. The forms of differences between the results from the age periods can best be explained that the respective groups learnt and acquired the language at different times and perhaps these times had certain features associated with the language. When we look at the KIT vowel, the acoustic and the statistical analysis shows that the young speakers realize the vowel in a retracted position, approximating it to the native speakers' vowel space. Between the young group, it was also observed that the females had a more retracted rendition of the vowel than the males. Since this is an emerging change, it is possible to state the young female speakers are those who are

leading the change from the more fronted and raised version as seen in the middle-aged speakers and some of the old speakers to the more retracted and lowered varieties. This change seen in the speech of the young speakers can be attributed to different entities including the modern technological advancement with the social media and how globalized the world has become making it very possible for people to listen and communicate with native speakers on several fronts, therefore causing them to gradually assimilate their pronunciations. There is also the possibility of, perhaps, some of the teachers in the basic, secondary, and the university speaking a variety which is close to the one they have adopted recently in their interactions. Lastly, the change may have already taken place, together with the pronunciations of the local dialects and thereby pushing the young speakers to speak the variety that is gradually becoming ripe as the Ghanaian variety.

For the FLEECE vowel, there was no real statistical and acoustic difference between all the age groups so it can be said that the vowel has not categorically undergone change dating back to the years of usage in the country and among the Fante speakers of English.

The vowels which showed greater variation between them were the DRESS and the NURSE vowels. The clear overlap and fronting of these vowels have been recorded in several studies such as Awoonor-Aziaku (2018) and Ankomah (2017) in Ghanaian English as well as some studies in Scotland and Australia. What it means is that this is gradually becoming an accepted and widely used variant of the two vowels.

What all these means is that the age grading of the respondents can be seen in the description given by Sankoff (2006), who says that usually, changes

in the speech pattern of a group of people can be described as real-time or apparent time (see the literature review for more information). In the case of the data and respondents for the study, I equate their linguistic characteristic to be the apparent time classification since every age group learns the language that is available during their time of learning and that these languages they adopt do not change and evolve as they also grow. That is, the language variety one gets when learning the language, sticks with the person irrespective of the new changes that may be floating in the society at any point in time.

What this means is that, in the Ghanaian setting, generations grow with the language and that each new generation will stick to a particular form of the language and as it has been established earlier, the new generations usually carry the modifications and the variations as corresponding to their time.

Putting this into the perspective of the history of the English language as well as the modern trends in Ghana, we can say that the younger speakers are the indicators of phases of development of the English language. That is, the older speakers in this study linearly can be attributed to the early stages of the English language formalization in the country, corresponding to the implantation stage; the middle age groups refer to the stage where the English language gained roots and started adopting features in the native languages which were imbibed in the transplanted language with a bit of nativization pushing through the ranks; the third group or the young group partly represents the nativization stage and the endonormative stabilization because they are the leaders in propagating anew form of language, which is unique in its own to the Ghanaian setting, inculcating some ‘ghanaianisms’ and speaking with a feeling of ownership and belongingness.

Vowel Duration

Another vital detail to the description of the vowels of English is the study of the duration of the length of the vowels. In this light, I calculated the duration of the vowels under study to test their length as a means of describing and characterizing the vowels. In doing this, the pitch and the intensity of the vowels were measured to complement the duration figures of the respective vowels. The duration figures were duly extracted based on the description given earlier and then they were analyzed for differences and similarities. In the table below, I present the mean figures for the various vowels produced by the respondents for the study

Table 10: Mean figures of the duration of the vowels produced by the Fante speakers of English

Vowels	Young Group	Middle Group	Old Group
KIT	0.144405	0.143476	0.134735
FLEECE	0.219431	0.217935	0.191229
DRESS	0.174003	0.178359	0.155969
NURSE	0.216766	0.215676	0.207551

Source: Fieldwork, 2018.

From the table above, it is evident that all the three distinct age groups were able to adequately differentiate the vowels in terms of their duration with the short vowels having shorter durations as compared to the long vowels. However, something stands out and it is a very interesting observation. It is clear from the table that there is a clear consistent pattern between the vowel lengths of the Fante speakers of English. There is a cline in the production of the vowels, which is seen in the increase in the length of the vowels as the age difference decreases. That is, there is an inverse correlation between age and the length of these vowels. The old speakers in this study have the shortest vowel length,

followed by the middle age group and then the young age group, who have the longest vowel lengths.

This phenomenon is very interesting and the reasons for that can be interpreted on two fronts. First, we can look at it from the historical perspective that is diachronic through to the synchronic in the sense that the varieties can be placed in the Dynamic Model of language change and evolution. In principle, the speech of the old people can represent the historical aspect of Ghanaian English during the 'Foundation Phase' of the implantation of the English language in Ghana and its earliest development. Based on this, it will be right to say that the English spoken by the Fantes, in particular, was relatively short during the early stages of its acceptance and usage in Ghana and that in the historical context, the vowels of GhE were pronounced shortest during this period. Going forward, the length properties of the middle age group represent the changes it had gone through after a decade or two of its implantation in Ghana and this case, we will be looking at the state of the English in the 'Exornormative Stage' and the earlier part of the 'Nativisation Stage' of the development phases as pronounced by the Dynamic Model. During this stage, it can be asserted that the language had developed a little bit of length as regards the production of the vowels by the Fante speakers of English in Ghana. The last of the three, which is the young age group, represents the synchronic and the current state of English in the country. The vowels they produced are the longest of the three and this shows that the length of the vowels keeps increasing with generations and time in the country. It is therefore right to predict that in years to come, the vowels stand a high tendency of being produced longer than what I found in this study.

The second frame for the discussion of this pattern can be attributed to Sankoff's (2006) apparent time classification, where she propels that in a speech community, people learn the language that is available at a particular point in time. In this sense, it is right to state that it will relate to the claim that the length of the vowels of the distinct age groups was what were the norms during the time they were learning the language and that the type of language they acquire will stay with them for the rest of their lives. Based on the findings of this work, the study has been confirmed because, despite the several changes that language has undergone with time, the old speakers still maintain their distinct type of English they learned during their time. What all these means is that the English language is constantly changing in Ghana and it is very prudent to study and understand the diachronic and the synchronic characteristics of it to have a fuller appreciation of the language as spoken in Ghana.

Summary of Chapter

This chapter has discussed the statistical aspects of the quality of the vowels as they were produced by the respondents. It has revealed some of the statistical differences between the male speakers and the female speakers on one hand and has discussed how age affects the difference in pronunciation of the vowels. In addition to this, the duration of the vowels has also been described. In the next chapter, the final part of the research is discussed.

CHAPTER SIX

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Summary of the Work

The study sought to discuss the characteristic vowel quality and duration of the Fante speakers of English in Ghana. Based on this, I used theories and methods which were geared at helping to achieve the purpose of the study. On this quest, the work was broadly divided into six chapters. The first chapter is the introduction to the study. Here, all the necessary information such as the background to the study, the research questions, significance of the study among others were discussed to set the motion for the actual work and to create a phase for the understanding of the work.

The second part looked at the literature review of some theoretical and empirical studies which have been conducted in and around the topic under the field of study. In addition to this, the theories which were used for the work were duly discussed in this section. In the third chapter of the work, the methodology for the study was also discussed. I gave a detailed description and presentation of what I had to do to achieve the data for the study as well as the steps I took to analyze the data.

The fourth section of the work started the analysis and here, the acoustic findings of the data were explanatively addressed. I looked at the distinct acoustic characteristics of the vowels concerning the age groups and gender understudy and came up with some distinct features which characterized each age group. The fifth chapter was also a follow up to the analysis and here, the statistical analysis of the data was described to give empirical and concrete clues

as regards the variation in the three age groups. In this chapter too, the length of the vowels was discussed as a means of helping to describe the vowels.

The last chapter talks about the conclusion to the entire study and here, I look at the summary of the entire work, a summary of the findings, and then I present recommendations for further research.

Key Findings

The study sought the study the acoustic description of four vowels by Fante speakers of English in Ghana. Among the findings of the study, the key ones are presented below

The KIT Vowel /ɪ/

All three age groups were able to articulate and produce the /ɪ/ vowel in its vowel space. There were some variations, notwithstanding. Among the young speakers, the /ɪ/ vowel was slightly retracted to the backward position such that it was heading into the central vowel space of the respondents and approximately close to the RP realization of the vowel. The vowels of the young group were also slightly raised as compared to the other classified groups. The middle age group had a more fronted and lowered variation of the /ɪ/. This is the variant that is present in most of the earlier works on the vowels of the English spoken by Ghanaians. The third group had the most fronted and the most lowered variant of the vowel. This indicates the historical as well as the apparent time description of sounds as elicited by Schneider (2007) and Sankoff (2006) respectively.

The FLEECE Vowel /i:/

The /ɪ:/ vowel did not show any serious variations between the three age groups. All three of them were able to articulate the sound approximately in the

same vowel space. The little that can be said in terms of differentiation is that the young speakers had a more raised variant as compared to the other two remaining groups, who had a relatively lowered variation.

The DRESS Vowel /e/

All three groups were able to pronounce the /e/ vowel but there were some differences between them. Within the young speakers, the /e/ was retracted and raised towards /ɪ/ in some cases and retracted to the /ɜ:/ in other cases. The vowels themselves were most pronounced in a central position but some also occupied the /ɪ/ and the /ɜ:/ vowels spaces. The middle age group did not experience this raised variant of the vowel to the /ɪ/ vowel space but rather, the /e/ vowel mainly overlapped the space of the /ɜ:/ vowel to the point that it was not even conceivable at some point to tell the difference between the two. For the old group, the males had a more fronted variety of the vowel as compared to# the females. The /e/ vowel also overlapped the spaces of the nurse vowel but what is distinct in this age group is that the vowels are pronounced in a very backward position as compared to the other vowels.

The NURSE Vowel /ɜ:/

All three groups were also able to articulate the /ɜ:/ vowel but with some variations. The young group had a slightly raised variant and a more central one. Their pronunciation also overlapped the vowel space of the /e/ vowel just as the /e/ articulated the space of the /ɜ:/ vowel. The same happened for the middle age group where the /ɜ:/ vowel overlapped with the /e/ vowel to a point that it was impossible to tell from the two. With the old group, the /ɜ:/ vowel had three different realizations. The vowel overlapped the space of the /e/ vowel and some of the speakers had a very raised variant of the sound, thereby realizing the

vowel as the lettER vowel /ə/. This phenomenon has been recorded in other Ghanaian studies, the latest being Awoonor-Aziaku (2018).

The Duration of the Vowels

The analysis of the length of the vowels indicates that all the speakers were able to differentiate the short vowels from the long ones. This particular finding debunks claims by earlier scholars on the non-existence of the long vowels in GhE. The analysis also indicated that the length of the vowels had an inverse correlation with age: the older the person, the shorter the vowels, and the younger the person, the longer the vowels. This gives much-needed insight into the historical and the present state of the language as well as its future predictions.

In all the study revealed, confirmed, and debunked certain claims which were first held on nature and the characteristics of the English language as spoken by Ghanaians in Ghana.

Conclusion

The main purpose of the study was to conduct an acoustic study to investigate four vowels articulated by Fante speakers of English in Ghana. After the implantation of English in Ghana, it was prudent that the state, the changes, and the future predictions of the language need to be scientifically studied in the contexts of its usage. As a response to this, a lot of studies were conducted using the auditory or the impressionistic approaches to analyze the sounds of the language. These impressionistic studies have obvious flaws and hence the need to use scientific and objective methods to study the language. Therefore, this study used acoustic means to analyze four RP vowels as pronounced by Fante speakers of English.

The study primarily looked at the vowel quality and the length distinctions of the respondents. Phonetically, the study has found out that all the 48 speakers sampled for the study realized all the four vowels understudy /ɪ, ɜː, e, ɪː/ although there were some phonemic differences in how the sounds were perceived. The study then agrees with that of Ankomah (2017), and Awoonor-Aziaku (2018) that the English spoken in Ghana has the tense and lax distinctions, which therefore makes it contradictory to the works of earlier scholars such as Bobda (2000), Huber (2008), Ofori, Dua & Mintah, 2014) among others who argued that the English spoken in Ghana does not make the tense and lax distinctions.

In addition to this, the study has confirmed studies such as Hay (2018), Ladefoged and Disner (2012), and Skandera and Burleigh (2005) that the actual description of the vowel lies in its quality and the length distinction is a bit periphery in terms of classification and identification of vowels. This, therefore, contradicts the arguments of scholars such as Lindblom (1968) who stated that English vowels primarily use length dimension to differentiate themselves.

Moreover, the study has shown that females usually have longer vowel renditions and are also the leading figures when it comes to language change and modification. Ladefoged and Disner (2012) note this and state that as long as the language conveys the same information, then there is nothing wrong with this phenomenon. The study has also confirmed studies such as Chambers (1995) that young speakers are usually the carriers and proponents of language change in any speech community since the carry the change artifacts of a language. Also, the study has described the progress of the language through the history of its implantation in the country to the current state as regards to

Schneider's (2007) Dynamic Model of Word Englishes. Also, in the view of age grading, the work has confirmed the apparent time distinction of language change as propounded by Sankoff (2006).

What I will say as the last word here is that every group of people is different in their ways and one key area of this variation is in language use and choices. Therefore, I intend to express the conviction that non-native languages should be studied differently from native languages and that the unique features of each language should be accepted as belonging to the people and not as a deviation to the native form of the language. In addition to this, even in heterogeneous communities where people have different histories and cultures, the languages of these people should be studied in isolation to fully appreciate the idiosyncrasies of the languages and avoid oversimplification and over-generalizations of the languages spoken.

Implications of the Study

The study has some contributions to research, pedagogy, and finally to theory. In the view of research, this study has demonstrated that there are so many distinct features of the English spoken in Ghana which is very peculiar and idiosyncratic to the people in the country. It is, therefore, prudent that the subsequent research in this field should be directed at targeting the features that distinguish the English spoken in Ghana from those spoken in other parts of the continent on one hand and the native speaker variety on another.

When it comes to pedagogy, it is incumbent on us to teach and learn the variety which is distinct to the country and the region. We now use English in almost every facet of our livelihoods and as such, the language has taken on some additional features which are peculiar to us. To this effect, teaching and

learning of the language should be based on the features which are identifiable in how we use the language. However, to appreciate all these, there is the need to devote more time to describe the language in detail so that the features which define it will be well documented and implemented in the teaching and learning syllable. This, therefore, explains the importance of the scientific studies that have been referenced severally in this work (e.g., Ankomah, 2017; Awoonor-Aziaku, 2018) and now this current study. These values, together with other similar ones, can help to distinguish on one hand and characterize on the other, a detailed description of the Ghanaian variety of English which will be adequate for pedagogy and codification.

Finally, this work has implications for theory in the sense that this work has tested and proven certain theories to be legitimate in its description and usage. Theories such as the source/filter theory, the variationist theory, the apparent and real-time theory, and the Dynamic Model theory have been tested in this work. In my estimation, I believe all these theories have strong applicability and similitude but the only concern I will express is the linearity of the Dynamic Model, which to me should be more expanded to include overlapping phases in its analysis. It is in this vein that later theories such as the Unified Classification of World English (Owusu-Ansah et al., 2016) should be given much attention since it tries to address the linearity issue which bothers the Dynamic Model.

The work used Schneider's Dynamic Model as the theory for discussion. From the results I gathered from the study, I would like to make a few observations I made about the theory. First, I want to state that the theory is very helpful regards the study of post-colonial Englishes because, for this particular

study, the theory provided some very important and needed information. Generally, the theory provides a good explanation of the evolution of the English language in transplanted areas and provides good detail on how the language is meant to change with time.

However, after a careful appreciation of the theory, I found a few shortfalls in the theory. First, I think the theory is quite linear in its descriptions. I say this because Schneider did not provide details on the possibility that the stages of the theory could overlap. This is because it is possible to see a nation at a particular stage experiencing changes that are characteristic of the stages ahead. A typical example of this is seen in Huber's (2004) study of T-affrication in Ghanaian English where he reported a systematic gender-related variation. According to Schneider, this is a Phase 5 (Differentiation) feature of a post-colonial variety. In this current work, this finding by Huber (2014) is supported. In the analysis of the vowels, it became evident that there is a high level of gender variation between speakers across all the three distinct age groups. Though the young speakers, approximated to be at the Endonormative stage at best, depicted the most variation, it does not correspond to Schneider's projection in the theory.

As a common feature in Ghanaian English, it is right to state at this point the reason for this recurring feature is that Scheider (2007) does not provide enough details and description of the phonological classifications in the theory. The theory is mainly aligned to the other linguistic elements of the English language with very limited attention paid to phonetic descriptions.

With these said, I believe the theory is a very strong model of the classification of world Englishes and that at the moment, anyone who has intent

on studying the historical survey of English, especially non-native varieties can dwell on it for a detailed description. It is also important for us as researchers to try and address some of these challenges as latter works of Mufwene (2011) and Bousfiled (2006) sought to do. I believe works in progress such as the Unified Classification of World Englishes (Owusu-Ansah et al., 2016) will hope to address some of these challenges.

Recommendations

My experiences of this study have outlined certain recommendations I would hope other scholars and studies investigate. First, there should be an acoustic study dedicated solely to the duration of the length of vowels in the English spoken by Ghanaians. This will help to bring closure to the open debate of the presence of long vowels in the English spoken in Ghana. In addition to this, this study just looked at four vowels and I studied only Fante speakers; therefore, there should be studies that will focus on the other vowels of the English language. Also, there should be other sociophonetic studies that will study the language characteristics of the diverse ethnic, social class, and educational levels and their impact on language as spoken in Ghana.

These different socio-phonetic studies will help to describe the total variations in the language and can be a starting point for serious codification and pedagogy of the English spoken by Ghanaians.

Finally, the study recommends that there should be other acoustic investigations into the speech of Ghanaians in general. Most of the studies on the speech patterns of GhE have been done using impressionistic approaches. This accounts for the disparity in ideas and findings. To curb this and to create a better environment for the analysis and description of GhE, acoustic

investigations should be encouraged over the impressionistic methods to help bring out objective and scientific findings for concrete descriptions.

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APPENDICES

APPENDIX A: STIMULI

UNIVERSITY OF CAPE COAST

DEPARTMENT OF ENGLISH

Dear respondent,

This reading list is for an academic exercise. It is part of a research that aims at investigating some speech sounds by Fante speakers of English in Ghana. Respondents of Ghanaian nationality, specifically, Fantes, are required to take part in this research. You are kindly requested to read the sentences allowed to help me record for later analysis. Your contributions will be treated with the utmost confidentiality.

Kindly, read the sentences aloud and as freely as possible;

1. The boys hit the bead on the blue bed.
2. The herd are deep in the pit.
3. A third book does not hurt a head in a dress.
4. I hid a thick pet in a bid to keep my bird in check from the heat.
5. A chip can help to curb dirty activities.
6. My bird can chirp on the deck of the car.
7. A heap of food shows a peak of growth.
8. I tip him to heed advice and do a good deed to perk his life.
9. The old cat is dead.
10. An itch on an eagle can be a heck of fun.
11. The exam board aired the program
12. It is a pity to eat uncooked eggs early in the morning.

APPENDIX B: Some Selected Formants of the Respondents

Context	F1	F2	F1	F2	F1	F2	F1	F2	F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
HIT	397	2132	404	2276	397	2132	419	2245	404	2263	405	2236	398	2256	410	2251	387	2156
HID	365	2156	412	2247	406	2156	417	2256	416	2260	409	2243	410	2214	389	2241	378	2149
PIT	402	2137	417	2281	412	2153	409	2262	407	2258	411	2256	404	2241	402	2226	375	2163
CHIP	411	2136	401	2258	422	2127	411	2248	408	2251	414	2103	407	2265	405	2223	369	2146
ITCH	386	2179	398	2266	418	2275	415	2112	406	2247	419	2345	400	2228	395	2271	381	2136
THICK	419	2261	419	2271	419	2261	413	2165	412	2240	417	2300	391	2249	391	2241	360	2124
PITY	361	2216	409	2283	409	2116	418	2254	419	2238	407	2231	412	2236	412	2240	357	2141
BID	424	2227	417	2249	424	2252	416	2312	415	2235	413	2264	402	2228	392	2263	370	2138
BEAD	297	2386	316	2357	317	2413	307	2331	287	2217	286	2337	271	2356	268	2361	261	2550
KEEP	319	2412	328	2341	319	2465	293	2342	293	2380	290	2344	268	2348	271	2324	268	2531
HEAP	281	2431	328	2375	286	2397	295	2353	301	2376	300	2349	276	2323	285	2367	253	2483
DEEP	312	2400	336	2368	267	2438	305	2212	286	2370	303	2352	278	2339	280	2341	269	2486
HEED	315	2458	322	2350	329	2420	303	2375	303	2365	309	2213	287	2362	288	2373	271	2512
DEED	314	2423	319	2371	314	2423	301	2154	305	2234	301	2361	261	2371	275	2358	267	2543
HEAT	295	2406	326	2341	295	2456	297	2381	282	2359	289	2372	271	2321	291	2347	251	2526

EAGLE	300	2370	335	2375	300	2370	300	2351	309	2349	304	2381	273	2340	279	2335	261	2473
BED	538	1712	527	1742	531	1706	511	1860	512	1753	511	1856	502	1763	491	1827	508	1838
DEAD	530	1713	537	1712	528	1895	475	1845	521	1797	514	1876	517	1853	512	1862	510	1846
EXAM	531	1705	515	1704	536	1845	515	1832	517	1812	527	1812	510	1834	510	1873	508	1854
DRESS	518	1831	517	1675	518	1812	529	1887	519	1768	523	1831	509	1856	515	1832	518	1839
EGG	476	1871	533	1751	476	1865	527	1775	522	1773	521	1763	512	1862	507	1856	520	1859
PET	528	1743	526	1712	528	1848	526	1779	525	1775	519	1775	511	1849	518	1860	515	1887
HEAD	535	1854	540	1748	494	1713	524	1759	513	1761	529	1765	496	1876	517	1846	519	1858
CHECK	513	1873	539	1856	513	1900	521	1769	526	1751	516	1771	500	1793	520	1836	509	1872
HERD	534	1713	532	1684	531	1687	534	1720	525	1703	521	1776	502	1653	500	1623	506	1484
BIRD	515	1668	543	1712	527	1657	532	1735	534	1709	531	1770	511	1700	502	1634	481	1526
AIRED	526	1712	528	1675	535	1712	520	1742	515	1715	534	1767	510	1631	489	1645	493	1494
DIRTY	531	1721	547	1645	563	1709	518	1700	520	1721	519	1762	507	1573	511	1612	498	1496
CURB	538	1718	528	1700	552	1654	516	1713	522	1731	516	1704	503	1537	508	1600	508	1519
EARLY	537	1659	549	1658	537	1648	527	1712	533	1736	523	1702	505	1654	507	1510	503	1536
THIRD	529	1634	553	1709	529	1611	525	1739	511	1702	525	1712	511	1621	512	1512	510	1554
CHIRP	537	1638	549	1721	537	1637	523	1761	521	1762	529	1741	507	1553	511	1437	502	1515

APPENDIX C: Some Selected Duration Figures of Respondents

Vowel	duration	vowel	duration	vowel	duration	Vowel	duration
HID	0.093233	HID	0.141933	HID	0.173113	HID	0.142113
ITCH	0.083183	ITCH	0.139189	ITCH	0.156318	ITCH	0.113834
BID	0.117407	BID	0.161333	BID	0.173181	BID	0.123424
CHIP	0.092072	CHIP	0.145632	CHIP	0.161182	CHIP	0.118324
HEED	0.173311	HEED	0.228323	HEED	0.276136	HEED	0.223842
EAGLE	0.114385	EAGLE	0.196781	EAGLE	0.227365	EAGLE	0.182424
DEED	0.197126	DEED	0.246222	DEED	0.257133	DEED	0.201342
DEEP	0.136685	DEEP	0.235427	DEEP	0.231741	DEEP	0.198244
HEAD	0.091651	HEAD	0.204142	HEAD	0.222373	HEAD	0.164411
BED	0.110051	BED	0.213178	BED	0.196614	BED	0.151841
PET	0.091651	PET	0.189732	PET	0.167313	PET	0.134244
EGG	0.090831	EGG	0.183139	EGG	0.167424	EGG	0.143231
HERD	0.141249	HERD	0.275274	HERD	0.253713	HERD	0.232248
BIRD	0.174385	BIRD	0.302134	BIRD	0.231472	BIRD	0.213148
AIRED	0.139298	AIRED	0.241313	AIRED	0.231322	AIRED	0.201313
CURB	0.121249	CURB	0.241218	CURB	0.229314	CURB	0.210311
HID	0.17444	HID	0.165604	HID	0.122966	HID	0.157258
ITCH	0.157388	ITCH	0.132134	ITCH	0.092324	ITCH	0.142946
BID	0.191126	BID	0.175202	BID	0.113848	BID	0.160479
CHIP	0.153311	CHIP	0.151373	CHIP	0.109133	CHIP	0.140032
HEED	0.280391	HEED	0.253147	HEED	0.229933	HEED	0.247671
EAGLE	0.2415	EAGLE	0.213164	EAGLE	0.168139	EAGLE	0.211638
DEED	0.28328	DEED	0.277288	DEED	0.201348	DEED	0.22381
DEEP	0.267313	DEEP	0.251367	DEEP	0.163222	DEEP	0.22031
HEAD	0.225371	HEAD	0.192703	HEAD	0.157244	HEAD	0.186136
BED	0.231263	BED	0.189387	BED	0.142427	BED	0.181377
PET	0.204244	PET	0.178362	PET	0.113734	PET	0.167383
EGG	0.201341	EGG	0.178312	EGG	0.124337	EGG	0.173229
HERD	0.265347	HERD	0.216551	HERD	0.224247	HERD	0.221317

BIRD	0.286638	BIRD	0.226005	BIRD	0.203474	BIRD	0.241383
AIRED	0.257731	AIRED	0.195051	AIRED	0.188113	AIRED	0.216343
CURB	0.257318	CURB	0.201113	CURB	0.180013	CURB	0.217383
HID	0.178126	HID	0.149476	HID	0.143171	HID	0.163995
ITCH	0.19009	ITCH	0.171931	ITCH	0.145079	ITCH	0.145279
BID	0.176355	BID	0.173222	BID	0.158579	BID	0.169918
CHIP	0.167363	CHIP	0.151341	CHIP	0.141213	CHIP	0.146317
HEED	0.277187	HEED	0.213744	HEED	0.232455	HEED	0.216372
EAGLE	0.241385	EAGLE	0.206031	EAGLE	0.181777	EAGLE	0.201334
DEED	0.294243	DEED	0.231838	DEED	0.232655	DEED	0.219836
DEEP	0.241673	DEEP	0.221343	DEEP	0.201383	DEEP	0.210083
HEAD	0.215499	HEAD	0.176285	HEAD	0.195002	HEAD	0.163454
BED	0.225518	BED	0.186232	BED	0.196318	BED	0.173248
PET	0.207156	PET	0.157238	PET	0.172009	PET	0.157243
EGG	0.216371	EGG	0.157134	EGG	0.181313	EGG	0.161112
HERD	0.278391	HERD	0.230054	HERD	0.276346	HERD	0.224247
BIRD	0.293421	BIRD	0.251472	BIRD	0.279931	BIRD	0.231377
AIRED	0.26533	AIRED	0.221351	AIRED	0.245853	AIRED	0.213111
CURB	0.271342	CURB	0.221714	CURB	0.254288	CURB	0.210833