UNIVERSITI PUTRA MALAYSIA

CROSS-LANGUAGE PERCEPTION AND PRODUCTION OF STOPS AND FRICATIVES AMONG MALAY AND HAUSA NATIVE SPEAKERS

JAMILU ABDULLAHI

FBMK 2018 64

CROSS-LANGUAGE PERCEPTION AND PRODUCTION OF STOPS AND FRICATIVES AMONG MALAY AND HAUSA NATIVE SPEAKERS

By

JAMILU ABDULLAHI

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfillment of the Requirements for the Degree of Doctor of Philosophy

April 2018

COPYRIGHT

DEDICATION

To my supervisor, for her understanding, support, and patience in this long journey.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Doctor of Philosophy

CROSS-LANGUAGE PERCEPTION AND PRODUCTION OF STOPS AND FRICATIVES AMONG MALAY AND HAUSA NATIVE SPEAKERS

By

JAMILU ABDULLAHI

April 2018

Chairman : Associate Professor Yap Ngee Thai, PhD
Faculty : Modern Languages and Communication

This thesis presents results of a collection of studies that focuses on the production and perception of plosives, implosives, and fricatives by native speakers of Hausa and Malay. Selections of stops and fricatives were chosen from these two languages as they provided controls for interpretations of the analysis. Implosives are found in Hausa but not in Malay, and likewise specific stops and fricatives are found in Malay but not in Hausa. The first objective focuses on the production of stops and acoustic analysis of plosives and implosives by two groups of native speakers. The acoustic comparison would bring a further understanding of acoustic cues that are related with voiced plosives and voiced implosives. This will help in investigating the perception and production difficulties of the plosives and implosives. A total number of 45 Hausa native speakers and 45 Malay native speakers were recruited to participate in the study. All the participants were given a set of words consisting of the different combination of the target sounds to produce. PRAAT (Boersma & Weenink, 2001) was used to acoustically analyse all the recordings. In particular, voice onset time (VOT) and closure duration (CD) was measured for all the target consonants. The findings also showed that VOT is a distinctive feature that distinguishes place of articulation for various classes of plosives but it does not discriminate plosives from implosives. Instead, CD is a more reliable acoustic cue to differentiate between voiced plosives and voiced implosives. The result also show that the universal VOT categories (i.e. prevoicing, short voicing lag, and long voicing lag) are not refined enough to account for differences between plosives and implosives.

The second objective focuses on the discrimination of non-native fricatives and implosives. The study examined cross-language perception of stops (/ɓ/, /ɗ/, /b/, /d/, /p/, /t/) and fricatives (/f/, /v/, /z/, /t/, /s/) among Hausa speakers who have

little exposure to Malay and Malay native speakers who have no exposure to Hausa. This study functions as the base-line for interpretation of the third study where imitation of a presented stimuli becomes the focus. Audio-recording of Malay and Hausa words (minimal pairs) were used as stimuli. The target sounds (stops and fricatives) were at the initial positions of each pair of words and were presented in an AX discrimination task. The results revealed that the Malay and Hausa native speakers faced considerable difficulties and problems in perceiving most non-native sounds contrasts.

The third objective focuses on the production of non-native fricatives and implosives. The Hausa native speakers were asked to produce Malay fricatives while the Malay native speakers imitated Hausa voiced implosives. Their productions were recorded and analyzed by getting native raters to rate the accuracy of the production. The results showed that the Hausa native speakers often substituted the fricatives with plosives /p/ and /b/ sounds. Similarly, the Malay native speakers were unable to imitate the implosives correctly.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

PERSEPSI RENTAS BAHASA DAN PENGHASILAN HENTIAN DAN FRIKATIF DALAM KALANGAN PENUTUR NATIF MELAYU DAN HAUSA

Oleh

JAMILU ABDULLAHI

April 2018

Pengerusi : Profesor Madya Yap Ngee Thai, PhD
Fakulti : Bahasa Moden dan Komunikasi

Tesis ini mengutarakan dapatan koleksi kajian yang memfokuskan penghasilan dan persepsi mengenai plosif, implosif, dan frikatif oleh penutur natif Hausa dan Melayu. Pemilihan hentian dan frikatif telah diperoleh daripada dua bahasa disebabkan kedua-dua aspek tersebut menyediakan kawalan untuk interpretasi analisis. Implosif didapati dalam Hausa tetapi bukan dalam Melayu, dan sebaliknya hentian dan frikatif yang khusus diperoleh dalam Melayu tetapi bukan dalam Hausa. Soalan penyelidikan pertama memfokuskan penghasilan hentian dan analisis akoustik plosif dan implosif oleh dua kumpulan penutur natif. Perbandingan akoustik akan memberikan pemahaman selanjutnya mengenai kiu akoustik yang berkaitan dengan plosif dan implosif bersuara. Hal ini membantu dalam menyelidiki persepsi dan kesukaran penghasilan bagi plosif dan implosif. Sejumlah 45 penutur natif Hausa dan 45penutur natif Melayu telah direkrut untuk mengambil bahagian dalam kajian ini. Kesemua responden telah diberikan satu set kosa kata yang mengandungi kombinasi suara sasaran yang berbeza untuk dihasilkan. PRAAT (Boersma & Weenink, 2001) telah digunakan untuk menganalisis semua rakaman secara akoustik, terutamanya, VOT dan CD telah diukur bagi semua konsonan sasaran. Dapatan juga menunjukkan bahawa VOT merupakan ciri distintif yang membezakan tempat artikulasi bagi pelbagai kelas plosif tetapi tidak mendiskriminasikan plosif daripada implosif. Sebaliknya, CD merupakan kiu akoustik yang lebih dipercayai bagi membezakan antara plosif bersuara dan implosif bersuara. Dapatan juga menunjukkan bahawa kategori VOT sejagat (iaitu, prapenyuaraan, lag penyuaraan pendek, dan lag penyuaraan panjang) tidak begitu diperhalusi bagi memperlihatkan perbezaan antara plosif dan implosif.

Soalan penyelidikan kedua memfokuskan diskriminasi frikatif dan implosif bukan natif. Kajian ini meneliti persepsi hentian rentas bahasa (/ɓ/, /ɗ/, /b/, /d/, /p/, /t/) dan frikatif (/f/, /v/, /z/, /t/, /s/) dalam kalangan penutur Hausa yang mempunyai pendedahan yang amat terhad pada Melayu dan penutur natif Melayu yang tidak mempunyai pendedahan langsung pada Hausa. Rakaman audio perkataan Melayu dan Hausa (pasangan minimal) telah digunakan sebagai stimuli. Perkataan telah diperdengarkan dalam tugas diskriminasi AX dan subjek perlu menyatakan sama ada mereka mendengar dua patah perkataan yang berbeza, atau perkataan yang sama diperdengarkan dua kali oleh dua penutur yang berbeza. Dapatan yang diperoleh daripada tugas diskriminasi tuturan memperlihatkan bahawa penutur natif Melayu dan Hausa menghadapi kesukaran dan masalah yang agak besar dalam penerimaan kebanyakan bunyi bukan natif yang berkontras.

Soalan penyelidikan ketiga memfokuskan penghasilan frikatif dan implosif bukan natif. Penutur natif Hausa diminta untuk menghasilkan frikatif Melayu manakala penutur natif Melayu meniru implosif bersuara Hausa. Penghasilan mereka telah dirakam dan dianalisis menggunakan penilai natif bagi menilai ketepatan penghasilan tersebut. Dapatan menunjukkan bahawa penutur natif Hausa tidak berupaya untuk menghasilkan frikatif /f/ dan /v/ dengan tepat; mereka kerap menggantikan frikatif dengan plosif /p/ dan bunyi /b/ dalam bahasa natif mereka. Di samping itu, dapatan diperoleh dari tugas peniruan oleh penutur natif Melayu juga menunjukkan bahawa penutur natif Melayu tidak berupaya untuk meniru implosif dengan tepat.

ACKNOWLEDGEMENTS

First and foremost, I gratefully thank Merciful and Almighty Allah to be the source of all strength and patience to accomplish this work. Alhamdulillah, wish His blessing I have the ability to finish this thesis even though there are so many obstacles that I had to go through during the completion of this thesis.

At the end of this rewarding process of preparing my thesis, it is my responsibility to duly appreciate those people who helped me reach my goal. First and foremost, I am indebted to the members of my supervisory committee. The first person I would like to thank is my supervisor, Associate Professor Dr Yap Ngee Thai, for her inspiring suggestions, guidance, encouragement, and great patience with my seemingly endless revisions. Professor Yap cares about her students so much that she is just like a mother and I am really glad that I have had the privilege of getting to know her in my life.

Special thanks also go to my committee members, Associate Professor Dr Hj. Sabariah Md Rashid and Dr Vahid Nimehchisalem, not only for all the constructive comments to keep me ever focused on the principles of good research, but also for all the encouragement they have given me in the past years.

Special acknowledgement is extended to Professor Jane Setter of University of Reading, UK, Professor Dr. Stefanie Shamila Pillai of University of Malaya, Associate Professor Dr Wong Bee Eng, Associate Professor Dr. Tan Bee Hoon, Dr Ramiza Bt Darmi, and Professor Dr Shameem Rafik Khan of English Department, Universiti Putra Malaysia. I also extend my heartfelt thanks to Professor Balarabe Zulyadaini, Professor Muazu Mohammed Amin, Professor Tela Baba, of University of Maiduguri, and Professor Yakubu Magaji Azare, of Bayero University, Kano, Nigeria. Special thanks to Associate Professor Dr Asabe Sadiyya Muhammed, and Dr Abdulmumini Isah, dean Faculty of Arts and Education, Bauchi State University, Gadau, Nigeria.

My sincere thanks go to my family who supported me with their advice and finance. Lastly, I am eternally grateful to my wife and two children. Their love, support and understanding have made the gruelling years throughout my study bearable and helped me surmount that would surely have overwhelmed me if I had faced them alone. I love them with all my heart. Very special thanks also to my friends and colleagues especially Dr. Mukhtar Aliyu Muhammad, Dr. Ahmad Tanimu Jibrin, Hameed Adamu Muhammad, Hamza Bello, Dalal Alfadhil Attaher Salheen, Rawhi Yoseff Alshamalat, Hassan Isyaku, Yahaya Yakubu, and Auwal Yahaya, for their help, informal talks and support. Their patience is greatly appreciated.

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

Yap Ngee Thai, PhD
Associate Professor
Faculty of Modern Languages and Communication
Universiti Putra Malaysia
(Chairperson)

Sabariah Hj Md Rashid, PhD
Associate Professor
Faculty of Modern Languages and Communication
Universiti Putra Malaysia
(Member)

Vahid Nimehchisalem, PhD
Senior Lecturer
Faculty of Modern Languages and Communication
Universiti Putra Malaysia
(Member)

ROBIAH BINTI YUNUS, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

Declaration by graduate student

I hereby confirm that:

- this thesis is my original work;
- quotations, illustrations and citations have been duly referenced;
- this thesis has not been submitted previously or concurrently for any other degree at any institutions;
- intellectual property from the thesis and copyright of thesis are fully-owned by Universiti Putra Malaysia, as according to the Universiti Putra Malaysia (Research) Rules 2012;
- written permission must be obtained from supervisor and the office of Deputy Vice-Chancellor (Research and innovation) before thesis is published (in the form of written, printed or in electronic form) including books, journals, modules, proceedings, popular writings, seminar papers, manuscripts, posters, reports, lecture notes, learning modules or any other materials as stated in the Universiti Putra Malaysia (Research) Rules 2012;
- there is no plagiarism or data falsification/fabrication in the thesis, and scholarly integrity is upheld as according to the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) and the Universiti Putra Malaysia (Research) Rules 2012. The thesis has undergone plagiarism detection software

Signature: _____ Date: _____

Name and Matric No: Jamilu Abdullahi, GS43382

Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) were adhered to.

Signature: _____
Name of Chairman of Supervisory Committee: Associate Professor Dr. Yap Ngee Thai

Signature: _____
Name of Member of Supervisory Committee: Associate Professor Dr. Sabariah Hj Md Rashid

Signature: _____
Name of Member of Supervisory Committee: Dr. Vahid Nimehchisalem

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

PAM	Perceptual Assimilation Model
SLM	Speech Learning Model
VOT	Voice Onset Time
CD	Closure Duration
TC	Two-Category
CD	Category-Goodness
SC	Single-Category
UC	Uncategorisable vs Categorizable
UU	Both-Uncategorizable
L1	First Language
L2	Second Language
AX	Discrimination Task
SA	Spectrographic Analysis
CDT	Categorical Discrimination Task
2 AFC	2 Alternate Force-Choice
AXB	Discrimination Trial
NA	Not specified
MNS	Malay Native Speakers
HNS	Hausa Native Speakers
LVC	Language Variation Change

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

This chapter discusses the problem statement, purpose statement, research objectives, research questions, research hypotheses, theoretical framework, conceptual framework, the significance of the study, the scope of the study, and overview of the thesis.

1.2 Background of the Study

Adult listeners of the second language have significant difficulties in the perception of most (but not all) phonetic dissimilarity that is not functional in their native languages (L1) (Best & Tyler, 2007; Best et al., 1988; Flege, 1995; Kochetov, 2004). This suggests that adults may possess perceptual differences which can interfere with the phonological learning of a second language. Previous researchers have pointed out the vital role of perception in acquiring non-native language speech sounds (Flege, 1990; Ingram, 1997; Wode, 1996). In line with that, some studies have shown that the native language (L1) phonological system directly influences the way sounds from a non-native language are perceived and produced (Flege, 1987; Major, 1987; Rochet, 1985; Santos, 2013). This results to the challenges that are being faced in the learning of a non-native phonetic and phonemic system.

According to Ellis (1994: 36), perception refers to “how stimuli are processed, sounds are heard and how a concept about them is formed in mind, consciously or not”. This relates to two dimensions of perception of a speech sound: cross-language perception and categorical perception. Studies on cross-language perception and non-native speech perception have focused mainly on discrimination of non-native contrasts as well as the identification of non-native differences that are absent in the first language (L1) of the listeners. Categorical perception, on the other hand, examined how good speakers/learners recognize a given stimulus in the native or non-native language. The stimuli words given to them were recognized and identified through “identification and discrimination tasks”. The identification and discrimination tasks are common designs used in testing categorical perception and cross-language perception (Logan & Pruitt, 1995).

Going by the models of speech perception and production, Flege (1995) hypothesized that the difficulties in the perception and production of non-native contrasts are due to similarities or differences between the native language (L1) and the non-native languages' phonological systems. The native language (L1) phonemes are likely to hinder the creation of new non-native phonological categories. This was found in a considerable number of studies that have shown how the phonological learning of L2 sounds are achievable for late learners, and their ability in the production and perception of suprasegmental and segmental non-native contrasts can increase, since the mechanisms used in the acquisition of the native language (L1) sound systems remain intact over the lifespan, and it can also be applied to non-native (L2) learning (Flege, 1995).

The research area that investigates the learning of non-native and second language phonemes is referred to as the "study of cross-language speech perception and production", which is also known as "phonetics of the second language" (Reetz & Jongman, 2009: 106). A question that this research field generally addresses is the extent to which the phonological system of the first language (L1) influences the production and perception of the second language (L2) sound. The main focus in these studies of cross-language speech perception is the perception of phonetic similarities of the non-native sounds by first language (native language) listeners (e.g., Best et al., 1996; Escudero, 2001; Williams, 1977). Just like the previous studies, this present study examines how cross-language perception and production of stops and fricatives differs across Hausa and Malay speakers. The study further examines how Hausa and Malay speakers perceive and produce non-native stops and fricatives in comparison to their native languages.

For the stop consonants, they are produced when the breath is completely stopped at some point in the mouth, by the lips or tongue-tip or tongue-back, and then released with a slight explosion (O'connor, 1980). Stops are abundantly represented in the world's languages and often are among the most frequently occurring consonants in a given language (Kent & Read, 2002). The Hausa stops sounds include /b/, /t/, /d/, /ɗ/ and ɓ/. Pulmonic egressive airstream mechanism is involved in the production of /b/, /t/, and /d/ sounds. These sounds are produced when the active and passive articulators block the air passage momentarily at some points before it is abruptly released resulting in a burst of air and energy (Sani, 2005). Glottalic ingressive airstream mechanism is involved in the production of implosives /ɓ/ and /ɗ/. Implosives are sounds made when the articulators make contact and block the air passage. However, during the closure release, the airstream sinks down the vocal tract (Sani, 2005). The implosives (/ɓ/ and /ɗ/) are reported to have glottal vibration. Ladefoged (1968:16) transcribes these two sounds as [ʔb and ʔd] respectively and notes that 'these sounds may be incidentally implosive on some occasions, but they are always distinguished from their voiced counterparts by being laryngealized' (IPA, 1999). On the other hand, the Malay language has only plosives /p/, /b/, /t/, /k/, /g/ and /d/ (Clynes & Deterding, 2011).

Next are the stop consonants and fricatives which are the focus of this present study given that both languages (Hausa and Malay) share some stops consonants (/b/, /t/, and /d/), but cross-language differences may be present in the physical realization of these stops, i.e. in terms of acoustic measures such as the Voice Onset Time and Closure Duration. According to Lisker and Abramson (1967), Voice Onset Time refers to the time lapse between the releases of a stop obstruction until the onset of vocal fold vibration. In cross-language studies, VOT is the primary acoustic cue used in evaluating the perception and production of stops consonants. In non-native research, VOT is a very useful acoustic parameter in the comparison between the sounds systems of the languages under comparison (Netelenbos, 2013). Hume et al. (1999) reported in their study on stops place perception by native listeners of Korean and American English that the phonetic salience of stop sounds always depends on vowel environment. It was also observed that the speakers also showed sensitivity to the place information in transitions and bursts.

Fricatives are consonants produced by forcing air through a narrow channel made by placing two articulators close together. For instance, the lower lip is pressed against the upper teeth for the fricatives (/f/, /v/, /s/, /z/). For the fricatives, the air stream mechanism involved is the pulmonic egressive airstream mechanism. It is involved in the production of fricatives, when the articulators simply approach one another, i.e., they do not make contact and block the air passage. As they make such approach, they narrow down the air passage to the extent that the air has to force its way out, thereby causing friction (Sani, 2005). More studies have shown that different perceptual cues are used for fricatives compared to stops. Fricatives spectra were studied in the context of meaningful words by Hughes and Halle (1956). They used natural speech when conducting this research. A large variation was discovered in the spectra across diverse speakers of the same phonetic sounds. The findings of the study show that a variation among the dissimilar classes of fricative sounds was fairly consistent, with energy at different frequencies.

1.3 Reason for Cross-Language Research

In understanding the processes of speech perception, research in cross-language perception is a critical testing ground as the universal phenomena of speech perception can only be discovered through explorations across different language families and different languages. Cross-language research reduces our locality and insularity and it is imperative to find out whether given perceptual experiences are language specific, or universal based on the general cognitive mechanisms found among humans.

Cross-language research has revitalized our studies of the natural change of speech perception in the first language (L1). Speech perception research on toddlers achieved new importance and interest when it was shown, not only that

toddlers were sensitive to almost all phoneme contrasts that were examined, but that during the early first year of life, toddlers began to tune out, or pay no attention to the divisions in the languages around them that were not functional (Best & Tyler, 2006; Tsukada et al., 2005). As the world becomes less distant with advent of technology, there is a possibility of contact between languages around the world.

1.4 Background of Hausa Language

The Hausa language belongs to the Afro-Asiatic language family, (Greenberg 1966), and it stands as the most powerful language in terms of speakers and prestige among the Westerly sub-group of the Chadic language, because of its considerable literature of poetry, prose and Islamic writings, written in a modified Arabic script (Ajami).

Genetic family tree of Hausa language:

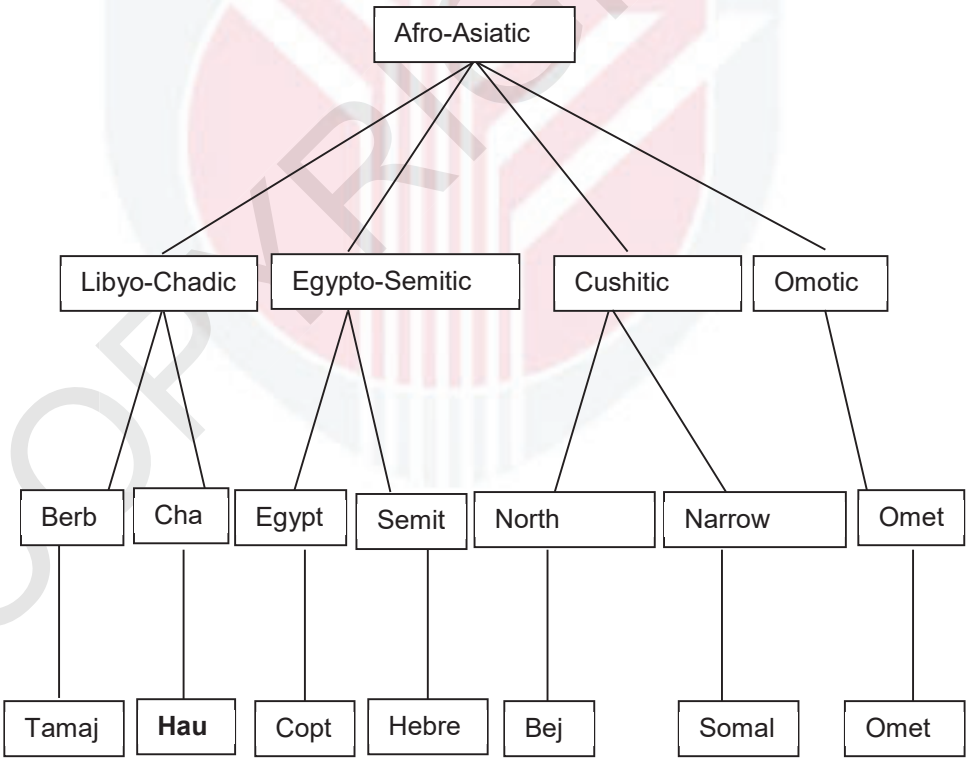

Figure 1.1 : Hausa genetic family tree
(Source : Encyclopedia Britannica, 2009)

In West African sub region, the Hausa language has the highest number of speakers. In Nigeria alone, the Hausa language has about thirty-four (34) million native speakers, spoken as the first language. It is a second language of about 18 million people and taken together, an approximate total of fifty two (52) million people (Nationalencyklopedin, 2007) in Nigeria. The Hausas have dominated more than half of the demographic map of Nigeria. In the Republic of Benin, it has about 900,000 speakers; in Burkina Faso about 500,000 speakers; in Cameroon about 2,300,000; in Togo about 900,029 speakers; in Sudan about nine 918,000 speakers; and In Niger about 12,000,000 speakers are said to have been in existence (Retrieved 2017-07-25: Ethnologue.com). The Hausa language is spoken across the West African sub-region, and it is also spoken in Central Africa, Chad, Congo, Eritrea, Saudi Arabia and North Western Sudan.

The following map shows the area (olive green) covered by the Hausa language:

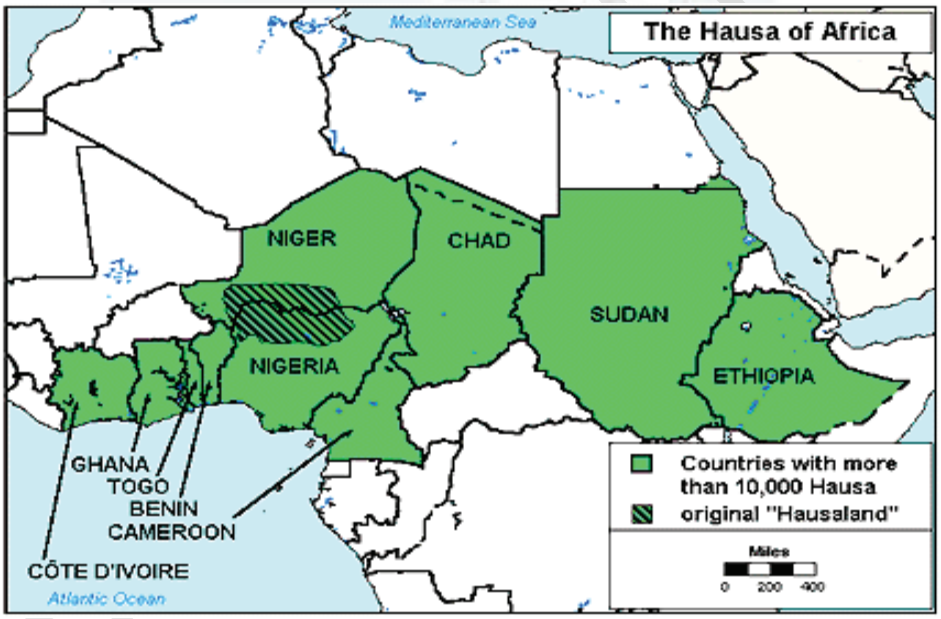

Figure 1.2 : Area covered by Hausa language
(Source : https://geneeugene.wordpress.com)

All the Hausa dialectologists seem to agree that although several Hausa dialects exist, these dialects are classified into two major sets based on their morphology, phonology and other features (Abubakar, 1983). The dialects of Katsina and Sokoto formed one group called Western dialects, while the dialects of Daura, Kano, Zaria, Bauchi, and Guddiri constitute another variety known as the Eastern dialect.

A standard language is a dialect in use by the educated speakers of that language (Abubakar, 1982). But unlike the speakers of the standard European languages, speakers of standard Hausa, whose dialect is based largely on Kano dialect, do not have any edge over the speakers of other dialects. The standardization of Hausa had its genesis with the establishment of Northern Region Literacy Agency (NORLA), in the year 1955 (Yahaya, 1988). The Hausa grammar used is a variety of "standard Hausa", which is a Kano dialect, and it is a form used in written language (e.g, newspapers, books, etc.) and also used in radio and television broadcastings. This is the dialect represented in the major dictionaries and grammar of the language prepared over the past century and in most pedagogical materials prepared for Americans and Europeans intending to learn the language.

1.4.1 Hausa Consonants

Investigation reveals in standard Hausa that there are thirty-four (34) consonant sounds (Sani, 2005; Skinner, 1977). This study concentrates only on the stops and fricatives of Hausa language.

Table 1.1 : Hausa stops and fricatives

S/no	Phoneme	Voicing	Place of articulation	Manner of articulation
1.	/t/	voiceless	alveolar	stop
2.	/d/	voiced	alveolar	stop
3.	/b/	voiced	bilabial	stop
4.	/ɓ/	voiced	bilabial	implosive
5.	/ɗ/	voiced	alveolar	Implosive
6.	/s/	voiceless	alveolar	fricative
7.	/z/	voiced	alveolar	fricative

The following table (Table 1.2 which is a Hausa consonantal chart indicates the positions of the stops and fricatives (bold faced) that are related to this study.

Table 1.2 : Hausa Consonantal Chart

	Bilabial	**Alveolar**	**Post-alveolat**	**Palatal**	**Palatalized velar**	**Velar**	**Labialized Velar**	**Glottal**
Plosive & Affricate	**b**	**t** **d**	tʃ dʒ		kj gj	k g	kw gw	ʔ
Implosive & Ejective Stop & Affricate	**ɓ**	ts' **ɗ**	(tʃ')	j'				
Nasal	m	n						
Fricative	φ	**s** **z**						h
Tap/Trill		r ɾ						
Approximant	w			j				
Lateral Approximant		l						

(Source : Sani, 2005; Malah & Rashid, 2015)

1.5 Background of Malay language

Malay is one of the members of Malayic subgroup of Austronesian family languages. The Malayic subgroup has languages such as Gayo in Sumatra, Iban in Borneo, and Minangkabau in Sumatra (Eades & Hajek, 2006). Adelaar (2005) reported that many local Malay dialects are found in Sumatra, Borneo, Malaysian Peninsular, and parts of Eastern Indonesia. Standard Malay is found in Malaysia, Brunei Singapore and Indonesia, and the language is referred to as a national language in those countries (Soderberg & Olson, 2008). All the Malay standard varieties have mutual intelligibility (i.e, ability to understand each other), which are reported to be derived from the standard Malay language of Johor (Malay of Johor) in Malaysian Peninsular (Steinhauer, 2005). With the influence of Javanese and Dutch, it was reported that Indonesia is the most divergent, and the other varieties spoken in Malaysian Peninsular differed phonetically and phonologically.

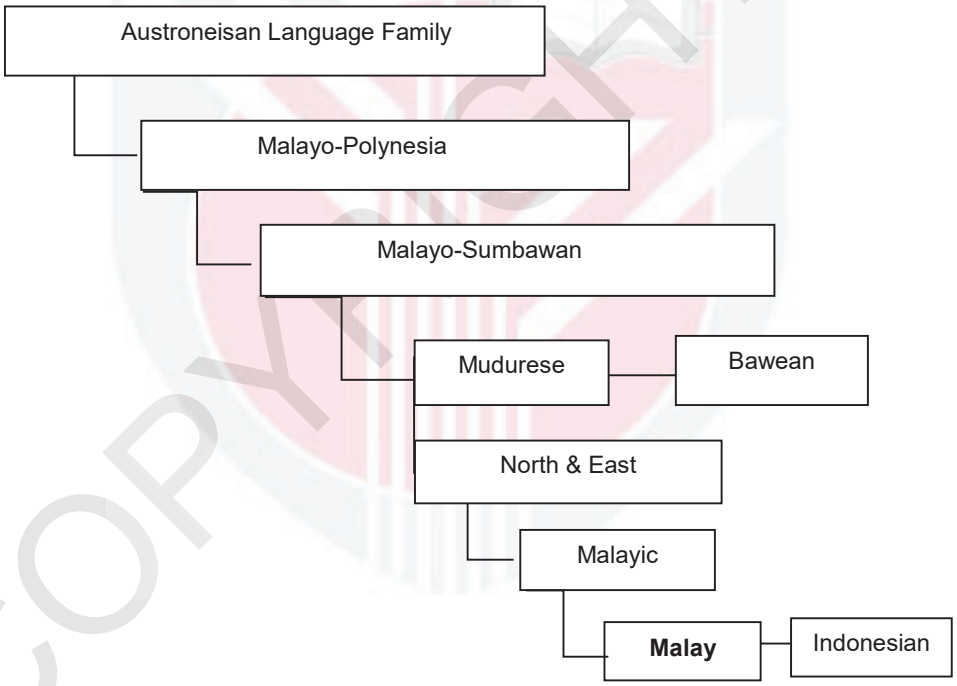

Figure 1.3 : Genetic family tree of Malay language
(Source : Encyclopedia Britannica, 2009)

1.5.1 Malay Consonants

There are 27 consonants in Malay (Tan & Ranaivo-Malancon, 2009). This study will concentrate only on stops and fricatives of Malay language as they are related to this study. The selections of stops and fricatives were chosen from these two languages as they provided controls for interpretations of the analysis. Implosives are found in Hausa but not in Malay, and likewise specific stops and fricatives are found in Malay but not in Hausa. The properties of the phonemic inventory of the two languages allows the researcher to examine the perception and production of the novel and familiar phonetic categories by naïve language learners.

Table 1.3 : Malay Stops and Fricatives

S/no.	Phoneme	Voicing	Place of articulation	Manner of articulation
1.	/t/	voiceless	alveolar	stop
2.	/d/	voiced	alveolar	stop
2.	/b/	voiced	bilabial	stop
3.	/p/	voiceless	labio-dental	stop
4.	/f/	voiceless	labio-dental	fricative
5.	/v/	voiced	labio-dental	fricative
6.	/s/	voiceless	alveolar	fricative
7.	/z/	voiced	alveolar	fricative

The following table which is a Malay consonantal chart indicates the positions of the stops and fricatives (bold faced) that are related to this study.

Table 1.4 : Malay consonantal chart

	Labial	Alveolar	Post-alveolar	Palatal	Velar	Glottal	Labial-velar
Plosives/ Affricates	**p b**	**t d**	t͡ʃ dz		k g	(?)	
Fricatives	**(f) (v)**	**s (z)**	(ʃ)		(x)	h	
Nasal	m	n					
Trill		r					
Approximant				j			w
Lateral		l					

(Source : Clynes and Deterding, 2011; Tan et al., 2009)

1.6 Statement of the Problem

Ladefoged and Maddieson (1996) and Maddieson (1984) reported that implosives are found in approximately ten percent of the world's languages, and Hausa is among the few languages that have a combination of plosives and implosives (International Phonetic Association, 1999; Sani, 2015). Despite the existence and importance of these sounds in many languages, no research has shown how the voiced plosives and voiced implosives differed and the relevant important acoustic cues that differentiated these sounds. Therefore, this study seeks to examine the acoustic features such as Voice Onset Time (VOT) and Closure Duration (CD) of plosives and implosives as the literature on stops in general suggests that these two acoustic measures are likely to be useful. For example, VOT has been confirmed to be a strong measure of the acoustic information of consonantal voicing distinctions in most languages. It is known to be an acoustic feature in discriminating between different classes of stop sounds (Abramson & Whalen, 2017). Hence, VOT could be a dependable acoustic cue used in differentiating voiced and voiceless stops of a language (Abramson, 1977). In addition, the acoustic comparison would bring a further understanding of acoustic cues that are related to voiced plosives and voiced implosives. Exploring the related acoustic cues among non-native speakers and second language learners will also be helpful as this understanding may help second language researchers understand better how second language sounds. In particular, the plosive and implosive consonants in this study are perceived and produced by second language learners.

By understanding the acoustic cues that distinguished voiced plosives and voiced implosives, researchers can propose ways to help students monitor their own production for the purpose of teaching and learning of Hausa as well as other languages that have the same combination of plosives and implosives. The results of this acoustic analysis will no doubt guide teaching and learning in the field of Hausa phonetics by exploring the acoustic features of Hausa stops, which according to the existing literature has never been examined. This present study is focused on the production and perception of plosives, implosives, and fricatives by native speakers of Hausa and Malay. Selections of stops and fricatives were chosen from these two languages as they provided controls for interpretations of the analysis. Implosives are found in Hausa but not in Malay, and likewise specific stops and fricatives are found in Malay but not in Hausa.

It is observed that non-native speech perception is generally problematic for adults because of the way they perceive the sounds is influenced by their native languages (Best, 1995; Flege, 1995; Polka, 1991; Polka et al., 2002; So & Attina, 2014; Strange, 1995). Several studies have revealed that non-native speakers of a language identified sound less accurately than the native speakers (Abrahamson & Tingsabadh, 1999; Tsukada, Xu & Rattanasone, 2015). Previous researchers proved that perceptual training improves non-native

speakers' ability to perceive and to produce non-native sounds effectively (Logan & Pruitt, 1995; Strange & Dittmann, 1984).

Several studies have also demonstrated that the difficulties in perceiving and consequently in producing non-native contrasts are due to the similarities and differences between the first language and non-native languages' phonological systems (Best & Tyler, 2007; Flege, 1987; Flege, 1990; Kochetov, 2004; Major, 1987; Rochet, 1985; Santos, 2013). Malay and Hausa languages are no exception in terms of the difficulties. These difficulties if measured precisely can help overcome learning difficulties of Malay and Hausa as a second language. The native language (L1) phonemes are likely to hinder the creation of new non-native phonological categories. Some studies on non-native speech perception and production have shown that adult listeners of a non-native and second language have significant difficulties in the perception of most (but not all) phonetic dissimilarities that are not functional in their native languages (Best, McRoberts, & Sithole, 1988; Best & Tyler, 2007; Flege, 1995; Kochetov, 2004; Tsukada, Xu, & Rattanasone, 2015). When listening to an unfamiliar non-native phonetic segment, inexperienced adult listeners are likely, due to their first language (L1) experience, to assimilate the second language (non-native) sounds to the most articulatory-similar first language (native) phonemes (Best, et al., 1991, 1994a, 1994b). These empirical problems have the capacity to permanently hinder the learning of non-native languages like Hausa and Malay as second languages. Current research on cross-language perception has shown how native language background affects listener's perception of non-native sounds (So & Attina, 2013). Listeners with little or no linguistic experience of the phonetic inventory of the non-native language tend to have difficulties in the perception and production of non-native phonemes. Several cross-language studies have been carried out in different languages on the perception and production of stop sounds (/b/, /d/, /p/, /t/, /k/) at the word-final and initial positions (Broersma & Scharenborg, 2010; Tsukada, 2006; Tsukada, 2005; Tsukada, 2007).

The previous related literature reviewed show that a lot of work has been done on plosives. However, research on implosives has not received much attention, particularly on the perception and production by non-native speakers. The same difficulties posed by plosives in second language acquisition could be posed by implosives also. There is, then, the need to investigate the accurate examples of such difficulties, and this could pave way to solving such anticipated difficulties. For instance, Laughlin (2005) examined the articulation and acoustic data on voiceless implosive stops in Seereer-Siin. The finding revealed that voiceless implosives in intervocalic positions could be characterized by silence period that lasts for at least 20 to 50 ms. In another study, Demolin and Vuillermet (2006) made a comparison between the African and American language voiceless implosives. They explored the similarities and dissimilarities exist between the African and American languages voiceless implosives. The findings showed that the main features of voiceless implosives are strong bursts,

which are preceded by short voicing and prevoicing, which is as a result of vocal tension relaxation when the larynx is rising.

Similarly, Xi (2009) examined the phonetic characteristics of implosives in a dialect of Chinese, focusing on how the implosives developed. The study found that the forced voiceless stops are the source of implosives, as the sound changes are determined by the aerodynamic need to initiate vocal cords vibration. The findings also showed that although there are all kinds of variations of implosives, the phonetic distinctions are determined by some physiological and physical factors. These factors also need further clarification in subsequent studies. In another study, Zhou (2010) examined the articulatory mechanisms and phonetic implications in the production of implosives in the Zhuang language. The finding of the research showed that the pitch, intensity, and power of vowels in the implosive syllable in a word are remarkably increased when compared with vowels in plosive syllables. Similar findings are possible when for example Malay people attempt to produce the Hausa implosives. Yidan (2014) described the voiced implosive's acoustic features of Wu dialect of Xianju province, based on the data collected via the Electroglottography (EGG) and acoustic signals. The findings of the study showed that nasal and voiced implosives share the same formants on low frequency. Voiced implosives may be the result of phonetic changes. However, none of their frameworks of speech perception and production included the perception of implosive sounds by naïve listeners of a language. Therefore, it is something that can be used to help students to monitor their own production for the purpose of teaching and learning of Hausa, for example.

In the same way, there is a scarcity of research on the perception and production of fricative sounds by non-native speakers of a language. The previous studies on perception and production of fricatives were focused on second language learners. For instance, Jehma and Phoocharoensil (2014) examined the difficulties faced by Pattani-Malay learners of English in the production of English stops and fricatives. The finding of the research showed that first language transfer influences the learners in producing English fricatives and stops. Most studies about the perception and production distinction between voiced and voiceless fricatives at the same place of articulation have been focused on the difficulties by ESL and EFL learners (see, for example, Pape, Jesus, & Birkholz, 2015; Maiunguwa, 2015; Wieling et al., 2017; Koffi & Bloch, 2017).

In response to the litany of issues raised above concerning the perception and production of non-native speech sounds in regards to a second language teaching and learning, the present study examines how cross-language perception and production of stops (/ɓ/, /ɗ/) and fricatives (/f/, /v/) differ across Hausa and Malay speakers. Malay native speakers are naïve to Hausa language phoneme inventory and vice-versa. The properties of the phonemic inventory of the two languages allow the researcher to examine the perception and production of the novel and familiar phonetic categories by naïve language

learners. Hausa language belongs to the Afro-Asiatic language family (Greenberg 1963). The Hausa language stands as the most powerful, in terms of prestige and speakers among the Westerly sub-group of the Chadic language. It is also accorded so much prominence given its considerable legacy of literature, which comes in the form of poetry, prose and Islamic writings recorded in a modified Arabic script, the *Ajami*. The language is one of the few languages that implosive sounds can be found (Ladefoged & Maddieson, 1996; Maddieson, 1984; Sani, 2015; Schuh & Yalwa, 1999). According to Ladefoged and Maddieson (1996:82); and Maddieson (1984:111), implosives are approximately found in ten percent of the world's languages. On the other hand, the Malay language is an Asian language, a member of an Austronesian family of languages (Clynes & Deterding, 2011; Maris, 1979; Oshodi, 2013; Xi, 2009). Similarities and differences between the native and non-native languages' phonological systems may result in the difficulties in the perception and production of non-native contrasts (Flege, 1995).

The voiced bilabial stop /p/ is not found in the phonemic inventory of Hausa language and neither are the voiced labio dental fricative (/v/) and voiceless labio dental fricative (/f/) (Bello, 2014; 2003; Maiunguwa, 2015; Malah & Md Rashid, 2015; Sani, 2005). Voiced alveolar fricative (/z/) and voiced labio dental fricative (/v/) do not exist as sounds in the Malay phoneme inventory but occurs only as loanwords, which generally come from either English or Arabic (Clynes & Deterding, 2011). On the other hand, Hausa voiced bilabial implosive (/ɓ/) and voiced alveolar implosive (/ɗ/) are non-existent sounds in the phoneme inventory of the Malay language (Maris, 1979; Clynes & Deterding, 2011).

Overall, the foregoing presents a clear case for finding out how native speakers of a particular language, with little or no experience of phonetic inventory of another language from different family, perceive and produce implosive and fricative sounds. That is to identify how Malay native speakers perceive and produce Hausa implosive sounds and other stops and fricatives that are absent in the Malay phoneme inventory. And also, how Hausa native speakers perceive and produce Malay stops and fricatives sounds that are absent in the Hausa phoneme inventory. This observation is believed to have provided the basis and rationale for the conduct of the present study. Therefore, it is hoped that this research would help bridge the gap in the literature, which is associated with non-native phonetics and phonology.

1.7 Purpose of and Objectives of the Study

This study investigates how cross-language perception and production of stops and fricatives differ across Hausa and Malay native speakers. Its primary goal is to explore the acoustic characteristics of the consonant contrasts at word-initial position of the two languages and investigate how the stops and fricatives are

perceived and produced by native listeners. The specific objectives of this study are as follows:

1. To determine the acoustic similarities and differences in the production of stops by Malay and Hausa native speakers.
    (a) To determine the VOT values and CD for plosives such as /b/, /t/, /d/, and /p/ as produced by Malay and Hausa native speakers.
    (b) To determine the VOT values and CD for implosives such as /ɓ/ and /ɗ/ as produced by Hausa native speakers.
    (c) To determine the acoustic cues that differentiated Hausa plosives and implosives as in /b/ versus /ɓ/ and /d/ versus /ɗ/.
2. To examine how do Malay and Hausa native speakers perceive non-native contrasts.
    (a) To examine how do Malay native speakers discriminate word-initial implosives /ɓ/ and /ɗ/ contrast in Hausa.
    (b) To examine how do Hausa native speakers discriminate word-initial fricatives /f/ and /v/ contrasts in Malay.
3. To examine how do Malay and Hausa native speakers produce non-native contrasts?
    (a) To examine how do Hausa native speakers produce Malay fricatives /f/ and /v/.
    (b) To examine how do Malay native speakers imitate the Hausa implosives /ɓ/ and /ɗ/.

1.8 Research Questions

There were three main research questions that were addressed in this study. The first research question was focused on the production of stops by two groups of native speakers. The second research question was focused on the discrimination of non-native fricatives and implosives. The third research question was focused on the production of non-native fricatives and implosives.

The following list presents the research questions of this study.

1. What are the acoustic similarities and differences in the production of stops by Malay and Hausa native speakers?
    (a) What are the VOT values and CD for plosives such as /b/, /t/, /d/, and /p/ as produced by Malay and Hausa native speakers?
    (b) What are the VOT values and CD for implosives such as /ɓ/ and /ɗ/ as produced by Hausa native speakers?
    (c) What are the acoustic cues that differentiated Hausa plosives and implosives as in /b/ versus /ɓ/ and /d/ versus /ɗ/?

2. How do Malay and Hausa native speakers perceive non-native contrasts?
    (a) How do Malay native speakers discriminate word-initial implosives /ɓ/ and /ɗ/ contrast in Hausa?
    (b) How do Hausa native speakers discriminate word-initial fricatives /f/ and /v/ contrasts in Malay?
3. How do Malay and Hausa native speakers produce non-native contrasts?
    (a) How do Hausa native speakers produce Malay fricatives /f/ and /v/?
    (b) How do Malay native speakers imitate the Hausa implosives /ɓ/ and /ɗ/?

1.9 Research Hypotheses

As descriptive and inferential statistical analysis are needed to contrast distinctions between the two groups of native speakers (Malay and Hausa), hypotheses need to be generated for the study. The researcher proposed to test the following hypotheses:

H1: Hausa and Malay native speakers have different range of Voice Onset Time (VOT) values and Closure Durations (CD).

H2: There is a significant difference between the Malay and Hausa native speakers' discrimination of Hausa implosive sounds.

H3: There is a significant difference between the Malay and Hausa native speakers' discrimination of fricative sounds.

H4: There is a significant difference between the production of Malay fricative /f/ and /v/ by Hausa and Malay native speakers.

H5: There is a significant difference between the production of Hausa implosives /ɓ/and /ɗ/ by Hausa and Malay native speakers.

1.10 Theoretical Framework of the Study

As the present study investigated how Hausa and Malay native speakers perceive and produce non-native stops and fricatives, the researcher adopted the Perceptual Assimilation Model (PAM) (Best, 1993, 1994a, 1994b, 1995) and

Speech Learning Model (SLM) (Flege, 1995) as the framework for this study. The difficulties in the perception and production of non-native contrasts are due to dissimilarities or similarities between the native language and the non-native language phonological systems (Flege (1995). Adult listeners of non-native language have significant difficulties in the perception of most (but not all) phonetic dissimilarity that are not functional in their native languages (Best & Tyler, 2007; Best et al, 1988; Flege, 1995; Kochetov, 2004). The present study aims to advance an account for the perception and production of non-native naïve listeners based on the current non-native models. This study had reviewed interest in the literature, combining insights from current cross-language perception model of Best (1994) that is Perceptual Assimilation Model (PAM), which was developed specially to explain non-native speech perception by naïve listeners, and also Speech Learning Model (SLM), which is the most widely used model to describe the development of L2 speech production (Flege, 1995).

Given the Hausa native system that contains 2 implosive sounds (/ɓ/ and /ɗ/), the SLM would predict that both implosives will be assimilated to Malay /b-d/. Also, SLM will predict that both Malay fricatives (/f/ and /v/) will be assimilated to Hausa /p/ and /b/. The speakers are also likely to be more successful if they had started acquiring non-native phonemes earlier in life. The model, then, predicts some degree of success on the part of the speakers in differentiating these phonetic categories. At last, based on the SLM, no different predictions can be made in relationship to the performance of the non-native speakers on the new sound contrasts in perception and production tasks.

The discussion in this section demonstrates that this study would be guided by related models (PAM and SLM) in finding out the cross-language perception and production among Hausa and Malay native speakers, and their ability to perceive and produce non-native stops and fricatives sounds. The two models (SLM and PAM) that formed the theoretical framework for the purpose of this research would be discussed in more detail in the next chapter (Chapter 2).

1.11 Conceptual Framework

This research is focused on the cross-language perception and production of stops and fricatives of Hausa and Malay native speakers. As shown below, the acoustic cues of stops (Closure Duration and Voice Onset Time) and fricatives (Fricative noise, transition, and voicing) of native language will affect the non-native speakers' perception and production of speech sounds. Therefore, the acoustic cues of Hausa may vary when it comes to perception and production by Malay native speakers, and vice-versa. Additionally, this is also verify whether the tasks and methods designed are enough and well established to realize the objectives of this study.

The variables related to this study are AX discrimination task, acoustic measurements of VOT, acoustic measurement of CD, and aggregate scores of the participants by the raters in the production of fricatives and implosives. A diagram represents (see Figure 1.4) the combined constructs and variables to capture the essential connection applicable to this study.

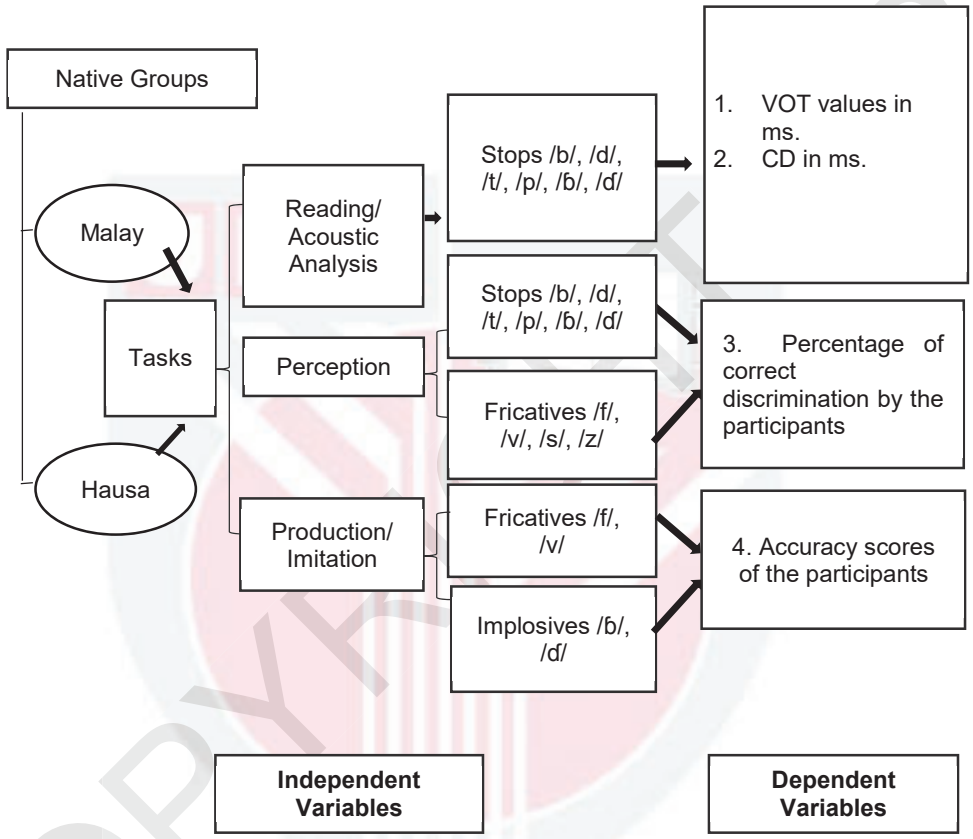

Figure 1.4 : Conceptual framework of the study

1.12 Significance of the Study

The aim of carrying out this research is an attempt to make a contribution to the existing literature in the area of non-native phonetics and phonology, and the field of phonetics and phonology in general. Also, the study is significant for the advancement of acoustic investigation that relates to the type of data employed, since the existing studies in the area have, in general, analysed reading or laboratory speech. This study can also help to consolidate new theoretical frameworks in the field of phonology, more specifically, in the area of acoustic and articulatory phonology, since it tries to incorporate the concept of gradience

and continuum of speech to clarify the phenomenon of aspiration in both Malay Native Speakers (MNS) and Hausa Native Speakers (HNS).

This research is focused on the perception and production of stops and fricatives by Hausa and Malay native speakers. Therefore, the research provides a significant contribution to the existing literature, which is lacking, especially, in the area of perception and production of implosive sounds by non-native listeners of a language. Researchers in the field of perception and production of non-native phonemes should find the results of this research significant due to its perceived contribution in providing more insight concerning the perception and production of non-native sounds.

Furthermore, the findings of this study can assist native speakers to gain a better understanding of the non-native sounds system, especially, the stops and fricatives sounds, and contribute to the general knowledge in the field of phonetics. It was highlighted by Jenkins and Yeni-Komshian (1995) that the general notion of speech perception cannot be explored through the study of one language, but through cross-lingual explorations. This study will, therefore, posit a universal claim on the perception of speech sounds across languages. The findings will also be useful in further linguistic research, and in particular, serve as reference material to both researchers/teachers and students of Hausa and Malay phonetics and phonology and of other languages in general.

Finally, the research highlights the value of systematically comparing groups of listeners from different first language backgrounds with the purpose of gaining a better understanding of the role of L1 experience in cross-language speech perception.

1.13 Definition of Key Terms

For a better understanding of the objectives and aim of this study, it is very useful to discuss the meaning of these linguistics key terms that are continually used in this research:

I. Production

Speech production in this study refers to the ability of Malay and Hausa native speakers to produce non-native stop and fricative sounds. The sounds can be measured through a reading task in which the native speakers produce the words that contain the target stops and fricatives at the initial positions of each word. The productions of the stop sounds can be measured acoustically to determine the acoustic correlates of the sounds between the two native speakers. On the other hand, the production of the fricative sounds can be

measured for intelligibility by raters who will identify the fricatives produced correctly by the participants.

II. Perception

Perception refers to how stimuli are processed, sounds are heard, and how a concept about them is formed in the mind, consciously or not (Ellis, 1994). Perception in this study refers to the ability of both Malay and Hausa native speakers to discriminate non-native stops and fricatives contrasts. Speech perception in this study can be measured in an AX discrimination task in which the participants will specify whether or not two stimuli in randomized word pairs were exemplars of the same phonetic category.

III. Plosives

Plosive consonants are produced when the breath is completely stopped at some point in the mouth by the lips or tongue-tip or tongue-back, and then released with a slight explosion (O'connor, 2000). The plosive consonants in this study refers to the native plosive sounds of Malay and Hausa which can be measured acoustically.

IV. Implosives

Implosive sounds are sounds produced using glottalic ingressive air stream mechanism. When the articulators make contact and separate, the air stream sinks down the vocal tract (Sani, 2005). Implosive sounds are the two imploded sounds in Hausa which were used in this study to examine how Malay native speakers perceive and imitate them.

V. Fricatives

Fricatives are consonants produced by forcing air through a narrow channel made by placing two articulators close together (O'connor, 2000). Fricative sounds in this study are the Malay sounds that are absent in Hausa phonemic inventory. The fricative sounds can be used in this study to measure its perception and production on Hausa native speakers.

VI. Naïve Listeners

Naïve listeners are listeners with little or no linguistic experience of the phonetic inventory of the non-native language (Best et al., 2001). Naïve listeners in this study refers to Malay and Hausa native speakers who have no experience of Hausa phonemic inventory, and vice versa.

VII. Voice Onset Time

VOT is the time between the release of the oral constriction for stops (plosive) production and the onset of vocal cords vibrations (Lisker and Abramson, 1964). It can also be defined as the interval between the release of stop closure and the onset of voicing. In this study, VOT will be used to differentiate between the classes of stops sounds of Malay and Hausa language.

VIII. Closure Duration

CD is the time interval between termination of the vowel-formant transition preceding the stop and onset of the transition to the following vowel. In this study, Closure Duration of stop sounds of Malay and Hausa can be measured.

1.14 Organization of the Study

This study on the perception and production of stops and fricatives by Malay and Hausa native speakers is organized into seven separate chapters. Chapter 1 discusses the background of the study where the emphasis was on an overview of speech perception and production, stop sounds, fricative sounds, cross-language research, as well as the theories of speech perceptions and productions. The chapter also presents the background of Malay and Hausa languages. Also in the chapter, problem statement, purpose statement and objectives, research questions, research hypotheses, theoretical framework, conceptual framework, the significance of the study and scope of the study have been discussed. Chapter 2 reviews previous and current research conducted in the area of stops and fricatives involving their perception and production by native and non-native speakers. Also in chapter 2, the speech perception and production theories are discussed with reference to the present study. Chapter 3 focuses on the methodological part which covers the research design, population, and sampling, instruments as well as the three tasks involved in the study. It also describes the procedures of the three tasks (perception, production, and imitation), and also the data analysis as well as the pilot study conducted.

Chapter 4 presents and discusses the results of acoustic analysis of Malay and Hausa stop sounds. The VOT and CD were measured between the two languages by providing the descriptive and inferential statistics to find out the significant differences between the Malay and Hausa VOT values and CD. Chapter 5 presents the results and discussion of the speech perception test. The chapter starts by reporting the results of the perception of stops and fricatives by the two groups of listeners. Finally, the chapter reports the descriptive and inferential statistics in relation the perception of the target phonemes, and the results obtained were described in the light of available speech perception models. Chapter 6 presents the results of the production of fricatives /f/ and /v/

by the two native groups, and also presents the results of the imitation of Hausa implosive sounds by Malay native speakers. The last chapter, which is chapter 7, presents the summary, theoretical implications of the study, recommendations as well as the limitations and suggestions for further studies.

1.15 Summary

This chapter serves as an introduction to the present study on Cross-language Perception and Production of Plosives and Fricatives among Hausa and Malay Native Speakers. The chapter introduces the background of the study, reason for cross-language research, background of Hausa and Malay languages, problem statement, purpose statement and objectives, research questions, research hypotheses, theoretical framework, conceptual framework, significance of the study, scope of the study, definition of key terms, and finally the organization of the study.

The next chapter will present the literature review that informs the foundation of this research and provides some insight about acoustic information and measurements of stops, speech perception of stops and fricatives, and then imitations and productions of non-native speech sounds.

REFERENCES

Abdelli-Beruh, N. (2005). The stop voicing contrast in French sentences: Contextual sensitivity of vowel duration, closure duration, voice onset time, stop release and closure voicing. *Phonetica*, *61*(4), 201-219.

Abramson, A. S., & Tingsabadh, K. (1999). Thai final stops: Cross-language perception. *Phonetica*, *56*(3-4), 111-122.

Abramson, A. S., & Whalen, D. H. (2017). Voice Onset Time (VOT) at 50: Theoretical and practical issues in measuring voicing distinctions. *Journal of Phonetics*, *63*, 75-86.

Abramson, A.S., (1977). Laryngeal timing in consonant distinctions. *Phonetica,* 34, 295–303.

Abubakar, A. (1982). *Generative phonology and dialect variation: a study of Hausa dialects* (Doctoral dissertation, School of Oriental and African Studies (University of London))

Abubakar, A. (2001). *An Introductory Hausa Morphology*. Maiduguri: Faculty of Arts, University of Maiduguri. Nigeria.

Adelaar, K. A., & Himmelmann, N. (Eds.). (2005). *The austronesian languages of asia and madagascar* (Vol. 7). Psychology Press.

Allwood, E. and Scully C. (1985). Production and perception of an articulatory continuum for fricatives of English. *Speech Communication*, 4, 237-245.

Alwan, A., Jiang, J., & Chen, W. (2011). Perception of place of articulation for plosives and fricatives in noise. *Speech communication*, *53*(2), 195-209.

Aoyama, K. (2003). Perception of syllable-initial and syllable-final nasals in English by Korean and Japanese speakers. *Second Language Research*, 19,3 pp. 251-265.

Arciuli, J., Rankine, T., & Monaghan, P. (2010). Auditory discrimination of voice-onset time and its relationship with reading ability. *Laterality: Asymmetries of Body, Brain and Cognition*, *15*(3), 343-360.

Ary, D., Jacobs, L. C., Irvine, C. K. S., & Walker, D. (2018). *Introduction to Research in Education*. Cengage Learning.

Auzou, P., Ozsancak, C., Morris, R. J., Jan, M., Eustache, F., & Hannequin, D. (2000). Voice onset time in aphasia, apraxia of speech and dysarthria: a review. *Clinical Linguistics & Phonetics*, *14*(2), 131-150.

Baker, T. L. (1994). Doing social research. New York: McGraw-Hill Inc.

Bandaranayake, D. (2012). An auditory-perceptual interventions program for fricatives: Effects and implications for toddlers without fricatives. (Unpublished Doctorate Dissertation). University of Cincinnati.

Banov, I. K. (2014). The Production of Voice Onset Time in Voiceless Stops by Spanish-English Natural Bilinguals. (Master dissertation). Bringham Young University.

Bastian, J. (1962). Silent intervals as closure cues in the perception of stops. *Haskins Laboratories, Speech Research andInstrumentation*, 9, Appendix F.

Bastian, J., Eimas, P., & Liberman, A. (1961). Identification and discrimination of phonemic contrast induced by silent interval. *Journal of the Acoustical Societyof America*, 33, 842(A).

Beckman, J., Jessen, M., & Ringen, C. (2009). German fricatives: coda devoicing or positional faithfulness? *Phonology*, *26*(2), 231-268.

Bello, H. (2014). Consonants Articulation problems of Hausa ESL learners of English: A case study of College of Legal and Islamic Studies. M.A. Thesis. International University of Africa, Khartoum, Sudan.

Bennett, R. (2010). Contrast and laryngeal states in Tz'utujil. In The UCSC Linguistics Research Center, pp. 93–120.

Benton, W. (1996). Encyclopedia Britannica.

Best, C. (1990). Adult perception of nonnative contrasts differing ion assimilation to native phonological categories. *Journal of the acoustic Society of America*, 88, S177.

Best, C. (1993). Emergence of language-specific constraints in perception of nonnative speech. A window on early phonological development. In B. de Boysson-Bardies, S. de Schonen, P. Jusczyk, P. McNeilage & P. Morton (eds.), Developmental neurocognition: speech and face processing in the first year of life, pp. 289-304. Durdrecht: Kluwer.

Best, C. (1994a). The emergence of native-language phonological influences in infants: A perceptual assimilation model. In the development of speech perception: The transition from speech sounds to spoken words, ed. J. Goodman and H. C. Nusbaum. Cambridge MA: MIT Press.

Best, C. (1994b). Learning to perceive the sound pattern of English. In Advances in Infancy Research, ed. C. Rovee-Collier and L. Lipsitt. Hillsdale NJ: Ablex.

Best, C. (1995). A direct realist view of cross-language speech. In W. Strange (ed.), Speech perception and linguistic experience: Issues in cross-language research, pp. 171-204. Timonium, MD: York Press.

Best, C. & Strange, W. (1992). Effects of phonological and phonetic factors on cross-language perception of approximants. *Journal of Phonetics*, 20, 305-330.

Best, C. & Tyler, M. (2007). Nonnative and second-language speech perception: Commonalities and complementarities. In M. J. Munro & O.-S. Bohn (Eds.), *second language speech learning: The role of language experience in speech perception and production* (pp. 13-34). Amsterdam: John Benjamins.

Best, C. T., Faber, A., & Levitt, A. (1996). Assimilation of non-native vowel contrasts to the American English vowel system. *The Journal of the Acoustical Society of America*, *99*(4), 2602-2603.

Best, C. T., Levitt, A., & McRoberts, G. W. (1991). Examination of language-specific influences in infants' discrimination of prosodic categories. In *Proceedings of the XIIth International Congress of phonetic sciences* (Vol. 4, pp. 162-165).

Best, C. T., McRoberts, G. W., & Goodell, E. (2001). Discrimination of non-native consonant contrast varying in perceptual assimilation to the listener's native phonological system. *Journal of the AcousticalSociety of America, 109*, 775–794.

Best, C. T., Morrongiello, B. A., & Robson, B. (1981). Perceptual equivalence of acoustic cues in speech and nonspeech perception. *Perception & Psychophysics*, 29, 199–211.

Best, C. T., McRoberts, G. W., & Sithole, N. N. (1988). The phonological basis of perceptual loss for non-native contrasts: Maintenance of discrimination among Zulu clicks by English-speaking adults and infants. *Journal of Experimental Psychology: human perception and performance*, *14*(3), 345-360.

Bijankhan, M., & Nourbakhsh, M. (2010). Voice onset time in Persian initial and intervocalic stop production—corrigendum. *Journal of the International Phonetic Association*, *40*(01), 134-134.

Boersma, P. (2001). Praat, a system for doing phonetics by computer. Glot International, 5, 341-345.

Borden, G. J., Kim, D. H., & Spiegler, K. (1987). Acoustics of stop consonant-vowel relationships during fluent and stuttered utterances. *Journal of Fluency Disorders*, *12*(3), 175-184.

Broersma, M., & Scharenborg, O. (2010). Native and non-native listeners' perception of English consonants in different types of noise. *Speech Communication*, *52*(11-12), 980-995.

Burnham, D. (2003). Language specific speech perception and the onset of reading. Reading and Writing: *An Interdisciplinary Journal*, 16: 573-609.

Caruso, A.J., Burton, E.K., (1987). Temporal acoustic measures of dysarthria associated with amyotrophic lateral sclerosis. Journal of Speech and Hearing Research, 30, 80–87.

Chan, A. Y. (2010). Advanced Cantonese ESL learners' production of English speech sounds: Problems and strategies. *System*, *38*(2), 316-328.

Chan, A. Y. (2011). The perception of English speech sounds by Cantonese ESL learners in Hong Kong. *TESOL Quarterly*, *45*(4), 718-748.

Chang, D., & Heift, T. (2015). L1 Influence on Phonemic Perception: A Case Study with Native English and Mandarin Learners of German. *Die Unterrichtspraxis/Teaching German*, *48*(1), 84-99.

Chao, K. Y., & Chen, L. M. (2008). A cross-linguistic study of voice onset time in stop consonant productions. *Computational Linguistics and Chinese Language Processing*, *13*(2), 215-232.

Chen, L. M., Chao, K. Y., & Peng, J. F. (2007). VOT productions of word-initial stops in Mandarin and English: a cross-language study. *ROCLING 2007 Poster Papers*, 303-317.

Cheng, M. C. (2013). Voice onset time of syllable-initial stops in Sixian Hakka: Isolated syllables. *師大學報: 語言與文學類*, *58*(2), 193-227.

Cho, T., & Ladefoged, P. (1999). Variation and universals in VOT: evidence from 18 languages. *Journal of phonetics*, *27*(2), 207-229.

Cissé, I., Demolin, D., & Vallée, N. (2011). The acquisition of plosives and implosives by a Fulfulde-speaking child aged from 5 to 10; 29 months. In *Actes. The 17th International Congress of Phonetic Sciences (ICPhS XVII)* (pp. 17-21).

Cissé, I., Demolin, D., & Vallée, N. (2011). The acquisition of plosives and implosives by a Fulfulde-speaking child aged from 5 to 10; 29 months. In *Actes. The 17th International Congress of Phonetic Sciences (ICPhS XVII)* (pp. 17-21).

Clarey, J. C., Paolini, A. G., Grayden, D. B., Burkitt, A. N., & Clark, G. M. (2004). Ventral cochlear nucleus coding of voice onset time in naturally spoken syllables. *Hearing research*, *190*(1), 37-59.

Clynes, A. and Deterding, D. (2011). Standard Malay (Brunei). Journal of International Phonetic Association, 41, 259-268.

Cohen, A. D. (1991). The Contribution of SLA Theories and Research to Teaching Language.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hilldale, New Jersey: Lawrence Erlbaum Associate Publishers.

Cohen, J. (1992). A power primer. *Psychological Bulletin,112*, 155-159.

Connie, K. & Attina, V. (2013). Cross-language perception of Cantonese vowels spoken by native and non-native speakers. *J Psycholinguistic Res*, 43, 611-630.

Cooper, F. S., Delattre, P. C., Liberman, A. M., Borst, J. M., & Gerstman, L. J. (1952). Some experiments on the perception of synthetic speech sounds.*The Journal of the Acoustical Society of America*, *24*(6), 597-606.

Crystal, D. (2008). A Dictionary of Linguistics and Phonetics.

Dattalo, P. (2008). *Determining sample size: Balancing power, precision, and practicality*. Oxford: OUP.

Decker, T. N., & Carrell, T. D. (2004). *Instrumentation: An introduction for students in the speech and hearing sciences*. Psychology Press.

Demolin, D., & Vuillermet, M. (2006, March). Voiceless implosives: a comparison between American and African languages. In *presentation, Rara Conference, Leipzig* (Vol. 30).

Dmitrieva, O., Llanos, F., Shultz, A. A., & Francis, A. L. (2015). Phonological status, not voice onset time, determines the acoustic realization of onset f0 as a secondary voicing cue in Spanish and English.*Journal of Phonetics*, *49*, 77-95.

Dorman, M. F. & Loizou, P. C. (1996). Relative spectral change and formant transitions as cues to labial and alveolar place of articulation. *Journal of theAcoustical Society of America*, 100, 3825–30.

Dorman, M. F., Raphael, L. J., & Eisenberg, D. (1980). Acoustic cues for a fricative-affricate contrast in word-final position. *Journal of Phonetics*, 8, 397–405.

Dorman, M. F., Raphael, L. J., & Liberman, A. M. (1979). Some experiments on the sound of silence in phonetic perception. *Journal of the Acoustical Society of America*, 65, 1518–32.

Eades, D., & Hajek, J. (2006). Gayo. *Journal of the International Phonetic Association*, *36*(01), 107-115.

Elie, B., & Laprie, Y. (2017). Acoustic impact of the gradual glottal abduction degree on the production of fricatives: A numerical study. *The Journal of the Acoustical Society of America*, *142*(3), 1303-1317.

Ellis, R. (1994). *The Study of Second Language Acquisition*. Oxford: Oxford University Press.

Escudero Neyra, P. R. (2005). *Linguistic perception and second language acquisition: Explaining the attainment of optimal phonological categorization*. Utrecht University & LOT.

Escudero P. (2001). The role of the input in the development of L1 and L2 sound contrasts: language-specific cue weighting for vowels. In A. H.-J. Do, L. Dominguez & A. Johansen (eds.), Proceedings of the 25th Annual Boston University Conference on Language Development, 50-261. Somerville, MA: Cascadilla Press.

Esposito, A. (2002). On vowel height and consonantal voicing effects: Data from Italian. *Phonetica*, *59*(4), 197-231.

Faul, F. (2014). About G Power: G* Power Version 3.1. 9.2 Universitat Kiel.

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2009). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175-191.

Flege, J. (1991a). Perception and Production: The relevance of phonetic input to L2 phonological learning. In Crosscurrents in second language acquisition and linguistic theory, ed. T. Heubner, and C. ferguson. Philadelphia: John Benjamins.

Flege, J. (1991b). Age of learning affects the authenticity of voice onset time (VOT) in stops and consonants produced in a second language. *Journal of the Acoustic Society of America*, 89, 395-411.

Flege, J. (1993). Production and Perception of a novel, second-language phonetic contrast. J*ournal of the Acoustic Society of America*, 93,1589-1608.

Flege, J. (1995). Second-language Speech Learning: Findings and Problems. In Strange, W. (Ed.), Speech Perception and Linguistic Experience: Issues in Cross-Language Research (pp. 233-277). Timonium, MD: York Press.

Flege, J. (2002). Methods for assessing the perception of vowels in a second language. In E. Fava & A. Mioni (eds.), *Issues in clinical linguistics*, pp. 3-28. Padova: UniPress.

Flege, J. & Liu, S. (2001). The effect of experience on adults' acquisition of second language. *Studies in Second Language Acquisition*, 23, 527-552.

Flege, J. & MacKay, I. (2004). Perceiving vowels in a second language. *Studies in Second Language Acquisition*, 26, 1-34.

Flege, J. & Wang, C. (1989). Native-language phonotactic constraints affect how well Chinese perceive the word-final English //t/-/d/ contrast. *Journal of Phonetics*, 17, 299-315.

Flege, J. and Eefting, W. (1987). Cross-language switching in stop consonant perception and production by Dutch speakers of English. *Speech Communication*, 6, 185-202.

Flege, J. E., & Eefting, W. (1988). Imitation of a VOT continuum by native speakers of English and Spanish: Evidence for phonetic category formation. *The Journal of the Acoustical Society of America*, *83*(2), 729-740.

Flege, J. E., MacKay, I. R. A.&Meador,D. (1999). Native Italian speakers' perception and production of English vowels. *Journal of the Acoustical Society of America*, 106, 2973– 2987.

Flege, J. et al, (1995a). Factors affecting degree of perceived foreign accent in a second language. *Journal of the Acoustic Society of America*, 97:3125-34.

Flege, J. et al, (1995b). Effects of age of second-language learning on the production of English consonants. *Speech Communication*, 16:1-26.

Flege, J. et al, (1999). Native Italian speakers' perception and production of English vowels. J*ournal of the Acoustic Society of America*, 106, 2973-2987.

Flinker, A. M. (2012). *The electrophysiology of language perception and production*. University of California, Berkeley.

Foster, J. (2002). Data analysis using SPSS for windows versions 8 10: A beginner's guide. London. SAGE Publications.

Fowler, C. A., Brown, J. M., Sabadini, L., & Weihing, J. (2003). Rapid access to speech gestures in perception: Evidence from choice and simple response time tasks. *Journal of memory and language*, *49*(3), 396-413.

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (1996). *How to design and evaluate research in education* (Vol. 7). New York: McGraw-Hill.

Francis, A. L., & Driscoll, C. (2006). Training to use voice onset time as a cue to talker identification induces a left-ear/right-hemisphere processing advantage. *Brain and language*, *98*(3), 310-318.

Gamkrelidze, T. (1975). On the correlation of stops and fricatives in a phonological system. *Lingua*, 35, 231-261.

Garellek, M. (2013). Production and perception of glottal stops.) Unpublished Doctorate Dissertation). University of Califonia. Los Angeles.

George, D. & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference. 11.0 update* (4th ed.). Boston: Allyn & Bacon.

Gerstman, L. J. (1957). Perceptual dimensions for the friction portions of certain speech sounds. Unpublished doctoral dissertation, New York University.

Gidiya, A. (2016). Production of English vowels by Hausa ESL learners (Master Thesis). Universiti Putra Malaysia.

Gilbert, J. B. (2012). *Clear speech teacher's resource and assessment book: Pronunciation and listening comprehension in North American English*. Cambridge University Press.

Goto, H. (1971). Auditory perception by normal Japanese adults of the sounds “L” and “R”. *Neuropsychologia*, *9*(3), 317-323.

Greenberg, J. (1966): The Languages of Africa. Bloomington: Indiana University.

Grobler, I. J., Merwe, A., & Groenewald, E. (2002). Voice onset time of Afrikaans speaking children aged four to seven years. *Southern African Linguistics and Applied Language Studies*, 20, 47-63.

Grobler, I. J., van der Merwe, A., & Groenewald, E. (2002). Voice onset time of Afrikaans speaking children aged four to seven years. *Southern African Linguistics and Applied Language Studies*, *20*(1-2), 47-63.

Guerlekian, J.A., (1981). Recognition of the Spanish fricatives /s/ and /f/. J*ournal Acoustic Society of America*, 70, 1624–1627.

Hall´e, P. A., Best, C. T. & Levitt, A. (1999). Phonetic vs. phonological influences on French listeners’ perception of American English approximants. *Journal of Phonetics*, 27, 281–306

Halle, M. et al. (1957). Acoustic properties of stop consonant. *Journal of the Acoustical Society of America*, 29 107-116.

Hallé, P. A., & Best, C. T. (2007). Dental-to-velar perceptual assimilation: A cross-linguistic study of the perception of dental stop+/l/clusters. *The Journal of the Acoustical Society of America*, *121*(5), 2899-2914.

Hallé, P. et al, (1999). Phonetic vs. phonological influence on French listeners' perception of American English approximants. *Journal of Phonetics*, 27, 281-306.

Han, J. H., Zhang, F., Kadis, D. S., Houston, L. M., Samy, R. N., Smith, M. L., & Dimitrijevic, A. (2016). Auditory cortical activity to different voice onset times in cochlear implant users. *Clinical Neurophysiology*, *127*(2), 1603-1617.

Han, J. H., Zhang, F., Kadis, D. S., Houston, L. M., Samy, R. N., Smith, M. L., & Dimitrijevic, A. (2016). Auditory cortical activity to different voice onset times in cochlear implant users. *Clinical Neurophysiology*, *127*(2), 1603-1617.

Hansen, J. H., Gray, S. S., & Kim, W. (2010). Automatic voice onset time detection for unvoiced stops (/p/,/t/,/k/) with application to accent classification. *Speech Communication*, *52*(10), 777-789.

Hao, Y. C., & de Jong, K. (2016). Imitation of second language sounds in relation to L2 perception and production. *Journal of Phonetics*, *54*, 151-168.

Harris, K. S., Hoffman, H. S., Liberman, A. M., Delattre, P. C., & Cooper, F. S. (1958). Effect of third-formant transitions on the perception of the voiced stop consonants. *Journal of theAcoustical Society of America*, 30, 122–6.

Harris, K.S., (1958). Cues for discrimination of American English fricatives in spoken syllables. *Language and Speech*, 1, 1–17.

Heinz, J. M. & Stevens, K. N. (1961). On the properties of the voiceless fricative consonants. *Journal of the AcousticalSociety of America*, 33, 589–96.

Heinz, J. M., & Stevens, K. N., (1961). On the properties of voiceless fricative consonants. *Journal Acoustic Society of America*, 33, 589–596.

Hisagi, M., & Strange, W. (2011). Perception of Japanese temporally-cued contrasts by American English listeners. *Language and Speech*, *54*(2), 241-264.

Hodgson, P. & Miller, J. L. (1996). Internal structure of phonetic categories: Evidence for within-category trading relations. *Journal of the Acoustical Societyof America*, 100, 565–76.

Holliday, J. J. (2014). The perceptual assimilation of Korean obstruents by native Mandarin listenersa). *The Journal of the Acoustical Society of America*, *135*(3), 1585-1595.

Howard, D., Patterson, K., Wise, R., Brown, W. D., Friston, K., Weiller, C., & Frackowiak, R. (1992). The cortical localization of the lexicons. *Brain*, *115*(6), 1769-1782.

https://geneeugene.wordpress.com/2016/09/26/top-10-most-widely-spoken-languages-in-african/

Hughes, G. W., & Halle, M. (1956). Spectral properties of fricative consonants. *The journal of the acoustical society of America*, *28*(2), 303-310.

Hume, E., Johnson, K., Seo, M., Tserdanelis, G., & Winters, S. (1999). A cross-linguistic study of stop place perception. In *Proceedings of the XIVth international congress of phonetic sciences* (pp. 2069-2072).

Ingam, J. and Park, S. (1997). Cross-language perception and production by Japanese and Korean learners of English. *Journal of phonetics*, 25, 343-370. Academic Press Limited.

International Phonetic Association. (1999). *Handbook of the International Phonetic Association: A guide to the use of the International Phonetic Alphabet*. Cambridge University Press.

IPA, (2009). Handbook of the International Phonetic Association (Revised to 2009). Cambridge University Press.

Ishizaka, K., & Flanagan, J. L. (1972). Synthesis of voiced sounds from a two-mass model of the vocal cords. *Bell Labs Technical Journal*, *51*(6), 1233-1268.

Itoh, M., Samnuma, S., Tatsumi, I., Murakami, S., Fukusako, Y., Suzuki, T., (1982). Voice onset time characteristics in apraxia of speech. *Brain and Language*, 17, 193–210.

Jaber, M., & Hussein, R. F. (2011). Native speakers' perception of non-native English speech. *English Language Teaching*, *4*(4), 77.

Jäncke, L. (1994). Variability and duration of voice onset time and phonation in stuttering and nonstuttering adults. *Journal of Fluency Disorders*, *19*(1), 21-37.

Javkin, H. (1977). Towards a phonetic explanation for universal preferences in implosives and ejectives. Proceedings of the 3rd annual meeting of the Berkeley Linguistics Society, pp. 557-565.

Jehma, H., & Phoocharoensil, S. (2014). L1 Transfer in the production of fricatives and stops by Pattani-Malay learners of English in Thailand. *Asian Social Science*, *10*(7), 67.

Jenkins, J. J., & Yeni-Komshian, G. H. (1995). Cross-language speech perception: Perspective and promise. *Speech perception and linguistic experience: Issues in cross-language research*, 463-479.

Jiang, C., McPherson, B., & Ng, M. L. (2016). Voice onset time of alveolar stop/t/and realization of unaspirated affricates associated with Mandarin-speaking children with repaired cleft palate. *International journal of pediatric otorhinolaryngology*, *86*, 150-155.

Jiang, C., McPherson, B., & Ng, M. L. (2016). Voice onset time of alveolar stop/t/and realization of unaspirated affricates associated with Mandarin-speaking children with repaired cleft palate. *International journal of pediatric otorhinolaryngology*, *86*, 150-155.

Johnson, K. and Babel, M. (2010). On the perceptual basis of distinctive features: Evidence from the perception of fricatives by Dutch and English speakers. *Journal of Phonetics*, 38, 127-136.

Jones, C., & Meakins, F. (2013). Variation in voice onset time in stops in Gurindji Kriol: picture naming and conversational speech. *Australian journal of linguistics*, *33*(2), 196-220.

Jones, R. H. (1997). Beyond “listen and repeat”: Pronunciation teaching materials and theories of second language acquisition. *System*, *25*(1), 103-112.

Jongman, A. (1989). Duration of fricative noise required for identification of English fricatives. *Journal of theAcoustical Society of America*, 85, 1718–25.

Jongman, A., Wayland, R., & Wong, S. (2000). Acoustic characteristics of English fricatives. *The Journal of the Acoustical Society of America*, *108*(3), 1252-1263.

Jusczyk, P. W. (1993). From general to language-specific capacities: the WRAPSA model of how speech perception develops. *Journal of Phonetics, 21*, 3–28.

Kalveram, K. T., & Jäncke, L. (1989). Vowel duration and voice onset time for stressed and nonstressed syllables in stutterers under delayed auditory feedback condition. *Folia Phoniatrica et Logopaedica*, *41*(1), 30-42.

Kang, Y. (2014). Voice Onset Time merger and development of tonal contrast in Seoul Korean stops: A corpus study. *Journal of Phonetics*, *45*, 76-90.

Kawai, N. et al (2012). The effects of duration and frequency of occurrence of voiceless fricatives on listeners’ perceptions of sound prolongations. *Journal of Communication Disorder*, 45, 161-172.

Kent, R. & Read, C. (2002). Acoustic Analysis of Speech. 2nd Edition. University of Wisconsin-Madison. Thomson Learning.

Kent, R. D., Kent, J. F., & Rosenbek, J. C. (1987). Maximum performance tests of speech production. *Journal of Speech and Hearing Disorders*, *52*(4), 367-387.

Kenworthy, J. (1987). Teaching English Pronunciation Longman. *New York*.

Kessinger, R.H., Blumstein, S.E., (1997). Effects of speaking rate on voice-onset time in Thai, French, and English. *Journal of Phonetics*, 25, 143–168.

Kewal, M. et al (2013). Classification of fricatives using novel modulation spectrogram based features. PReMI 2013, LNCS 8251, pp. 134-139.

King, K. A., Campbell, J., Sharma, A., Martin, K., Dorman, M., & Langran, J. (2008). The representation of voice onset time in the cortical auditory evoked potentials of young children. *Clinical Neurophysiology*, *119*(12), 2855-2861.

Kissling, E. M. (2014). Phonetics instruction improves learners' perception of L2 sounds. *Language Teaching Research*, 1362168814541735.

Kkese, E., & Petinou, K. (2017). Perception Abilities of L1 Cypriot Greek Listeners-Types of Errors Involving Plosive Consonants in L2 English. *Journal of psycholinguistic research*, *46*(1), 1-25.

Klatt, D.H., (1975). Voice onset time, frictation and aspiration in word initial consonant clusters. *Journal of Speech and Hearing Research*, 18, 686–705.

Koffi, E., & Bloch, M. (2017). The Acoustic Correlates of the Voiceless Palatal Fricative [ʃ] in Central Minnesota English. *Linguistic Portfolios*, *6*(1), 5.

Kong, E. J., Beckman, M. E., & Edwards, J. (2012). Voice onset time is necessary but not always sufficient to describe acquisition of voiced stops: The cases of Greek and Japanese. *Journal of phonetics*, *40*(6), 725-744.

Kuzla, C., & Ernestus, M. (2011). Prosodic conditioning of phonetic detail in German plosives. *Journal of Phonetics*, *39*(2), 143-155.

Ladefoged, P. (1968). *A phonetic study of West African languages: An auditory-instrumental survey* (No. 1). Cambridge University Press.

Lago, S. et al (2015). Categorical effects in fricative perception are reflected in cortical source information. *Brain and Language*, 143, 52-58.

Lago, S., Scharinger, M., Kronrod, Y., & Idsardi, W. J. (2015). Categorical effects in fricative perception are reflected in cortical source information.*Brain and language*, *143*, 52-58.

Lago, S., Scharinger, M., Kronrod, Y., & Idsardi, W. J. (2015). Categorical effects in fricative perception are reflected in cortical source information. *Brain and language*, *143*, 52-58.

Lahiri, A., Gewirth, L., & Blumstein, S. E. (1984). A reconsideration of acoustic invariance for place of articulation in diffuse stop consonants: Evidence from a cross-language study. *Journal of theAcoustical Society of America*, 76, 391–404.

Landefoged, P. & Maddieson, I. (1996). *The sounds of the World's Languages*, Oxford: Basil Blackwell.

Laughlin, F. (2005). Voiceless implosives in Seereer-Siin. J*ournal of International Phonetic Association*, 35/2 doi: 10.1017/S0025100305002215.

Laver, J. (1994). *Principles of Phonetics*. University of Edinburgh. Cambridge University Press.

Lee, S., & Iverson, G. K. (2008). Development of stop consonants in Korean. *Korean Linguistics*, *14*(1), 21-39.

Lee, S., & Iverson, G. K. (2008). Development of stop consonants in Korean. *Korean Linguistics*, *14*(1), 21-39.

Lehiste, I. (1976). Suprasegmental Features of Specch. In N. J. Lass (ed.) Contemporary Issues in Experimental Phonetics, New York: Academic Press, pp. 225-42.

Lehiste, I., & Shockey, L. (1980). Labeling, discrimination and repetition of stimuli with level and changing fundamental frequency. *Journal of Phonetics*.

Li, F., Munson, B., Edwards, J., Yoneyama, K., & Hall, K. (2011). Language specificity in the perception of voiceless sibilant fricatives in Japanese and English: Implications for cross-language differences in speech-sound development. *The Journal of the Acoustical Society of America*, *129*(2), 999-1011.

Liberman, A. M., Delattre, P. C., & Cooper, F. S. (1952). The role of selected stimulus variables in the perception of the unvoiced stop consonants. *AmericanJournal of Psychology*, 65, 497–516.

Liberman, A. M., Delattre, P. C., & Cooper, F. S. (1958). Some cues for the distinction between voiced and voiceless stops in initial position. *Language and speech*, *1*(3), 153-167.

Liberman, A. M., Delattre, P. C., Cooper, F. S., & Gerstman, L. J. (1954). The role of consonant-vowel transitions in the perception of the stop and nasal consonants. *Psychological Monographs*, 68(8) (Whole No. 379).

Lindblom, B. (1967). Vowel duration and a model of lip mandible coordination. *Speech Transmission Laboratory Quarterly Progress Status Report*, *4*, 1-29.

Lisker, L. (1957). Closure duration and the intervocalic voiced-voiceless distinction in English. *Language*, *33*(1), 42-49.

Lisker, L. & Abramson, A. (1967). Some effects of context on voice onset time in English stops. *Language and speech*, 10, 1-28. doi:10.1177/002383096701000101.

Lisker, L., Abramson, A.S., (1964). A cross-language study of voicing in initial stops: Acoustical measurements. *Word*, 20, 384–422.

Lisker, L., Abramson, A.S., (1970). The voicing dimension: some experiments in comparative phonetics. In: Proceedings of the 6th International Congress of Phonetic Sciences, 563–567.

Lisker, L., Abramson, A.S., (1971). Distinctive features and laryngeal control. Language 47, 767–785.

Liu, H., Ng, M. L., Wan, M., Wang, S., & Zhang, Y. (2008). The effect of tonal changes on voice onset time in Mandarin esophageal speech. *Journal of Voice*, *22*(2), 210-218.

Logan, J., & Pruitt, J. (1995). Methodological issues in training listeners to perceive non-native phonemes. In W. Strange (Ed.), *Speech Perception and LinguisticExperience: Issues in Cross Language Research* (pp. 351-378). Timonium, MD: York Press.

MacKain, K. S., Best, C. T., & Strange, W. (1981). Categorical perception of English/r/and/l/by Japanese bilinguals. *Applied Psycholinguistics*, *2*(04), 369-390.

MacKain, K. S., Best, C. T., & Strange, W. (1981). Categorical perception of English/r/and/l/by Japanese bilinguals. *Applied Psycholinguistics*, *2*(04), 369-390.

MacKay, Ian R.A.,(1987). Phonetics and the Science of Speech Production. Little, Brown and Co, Boston.

Macleod, A.A.N., Stoel-Gammon, C. (2005). Are bilinguals different? What VOT tells us about simultaneous bilinguals. *Journal of Multilingual Communication Disorders* 3, 2, 118–127.

Maddieson, I. (1984). The effects on F0 of a voicing distinction in sonorants and their implications for a theory of tonogenesis. *Journal of Phonetics*, *12*(1), 9-15.

Magloire, J. E. L., & Green, K. P. (1999). A cross-language comparison of speaking rate effects on the production of voice onset time in English and Spanish. *Phonetica*, *56*(3-4), 158-185.

Maiunguwa, A. (2015). Perception and production of English fricatives by Hausa speakers. Unpublished M.A. dissertation. Department of Linguistics. University of Malaya.

Malah, Z., & Rashid, S. M. (2015). Contrastive Analysis of the Segmental Phonemes of English and Hausa Languages. *International Journal of Languages, Literature and Linguistic,* 1 (2), 106-112.

Mann, V. (1991). Perception order and the effect of vocalic context on fricative perception. *Perception and Psychophysics*, 49, (5) 399-411.

Mann, V. A. & Repp, B. H. (1980). Influence of vocalic context on perception of the /*S*/-/s/ distinction. *Perception & Psychophysics*, 28, 213–28.

McCrea, C. R., & Morris, R. J. (2005). Comparisons of voice onset time for trained male singers and male nonsingers during speaking and singing.*Journal of Voice*, *19*(3), 420-430.

McCrea, C. R., & Morris, R. J. (2007). Effects of vocal training and phonatory task on voice onset time. *Journal of Voice*, *21*(1), 54-63.

Mesulam, M. (1990). Large-scale neurocognitive networks and distributed processing for attention, language, and memory. *Annals of neurology*, *28*(5), 597-613.

Mitterer, H., & Ernestus, M. (2008). The link between speech perception and production is phonological and abstract: Evidence from the shadowing task. *Cognition*, *109*(1), 168-173.

Mitterer, H., & Müsseler, J. (2013). Regional accent variation in the shadowing task: Evidence for a loose perception–action coupling in speech. *Attention, Perception, & Psychophysics*, *75*(3), 557-575.

Miyakawa, K., Strange, W., Vwebrugge, R., Liberman, A. M., Jenkins, J. J., & Fujimora, O. (1981). An effect of linguistic experience: The discrimination of [r] and [l] by native speakers of Japanese and English. *Perception & Psychophysics, 18*, 331–340.

Montrul, S. A. (2012). Is the heritage language like a second language?. *EuroSLA Yearbook*, *12*(1), 1-29.

Morris, R. J., Gorham-Rowan, M. M., & Herring, K. D. (2009). Voice onset time in women as a function of oral contraceptive use. *Journal of Voice*, *23*(1), 114-118.

Narayanan, S. S., Alwan, A. A., & Haker, K. (1995). An articulatory study of fricative consonants using magnetic resonance imaging. *The Journal of the Acoustical Society of America*, *98*(3), 1325-1347.

Nationalencyklopedin "Världens 100 största språk 2007" (The World's 100 Largest Languages in 2007), *SIL Ethnologue*

Netelenbos, N. (2013). *The development of voice onset time in French immersion children* (Doctoral dissertation, Lethbridge, Alta.: University of Lethbridge, Dept. of Psychology, c2013).

Newman, P. (2000). *The Hausa language: An encyclopedic reference grammar*. Yale

Nicole, A. and Fikkert, P. (2010). The acquisition of the stop-fricative contrast in perception and production. *Lingua*, 120, 1898-1909.

Nittrouer, S. & Crowther, C. S. (2001). Coherence in children's speech perception. *Journal of the Acoustical Society of America*, 110, 2129–40.

Niyogi, P., & Ramesh, P. (2003). The voicing feature for stop consonants: recognition experiments with continuously spoken alphabets. *Speech Communication*, *41*(2), 349-367.

Nusbaum, H. C., & Goodman, J. C. (1994). Learning to hear speech as spoken language.

O'Connor, J. (1980). Better English pronunciation. Second Edition. Cambridge University Press.

Öğüt, F., Kiliç, M. A., Engin, E. Z., & Midilli, R. (2006). Voice onset times for Turkish stop consonants. *Speech Communication*, *48*(9), 1094-1099.

Oh, G. E., Guion-Anderson, S., Aoyama, K., Flege, J. E., Akahane-Yamada, R., & Yamada, T. (2011). A one-year longitudinal study of English and Japanese vowel production by Japanese adults and children in an English-speaking setting. *Journal of phonetics*, *39*(2), 156-167.

Ohala, J.J., & Sole, M.J. (2010). Turbulence and phonology. In: S.Fuch,M.Toda,& M. Zygis (Eds.), Turbulent sounds: An interdisciplinary guide (pp. 37–101). Berlin: De Gruyter Mouton.

Ojukwu, O. (2007). Stricture relativity in Igbo and Yoruba implosives. *Lwati: A Journal of Contemporary Research*, *4*(1), 97-107.

Ortseifen, C., Bruckner, T., Burke, M. & Kieser, M. (1997). An overview of software tools for sample size determination. *Informatik, Biometrie & Epidemiologie in Medizin & Biologie, 28*, 91-118.

Oshodi, B. (2013). A cross-language study of the speech sounds in Yorùbá and Malay&58; Implications for Second Language Acquisition. *Issues in Language Studies*, *2*(1), 1-12.

Palo, P., Schaeffler, S., & Scobbie, J. M. (2005). Acoustic and Articulatory Speech Reaction Times with Tongue Ultrasound: What Moves First?.

Pape, D., & Jesus, L. M. (2015). Stop and fricative devoicing in European Portuguese, Italian and German. *Language and speech*, *58*(2), 224-246.

Pape, D., Jesus, L. M., & Birkholz, P. (2015). Intervocalic fricative perception in European Portuguese: An articulatory synthesis study. *Speech Communication*, *74*, 93-103.

Peng, J. F., Chen, L. M., & Lee, C. C. (2014). Voice Onset Time of Initial Stops in Mandarin and Hakka: Effect of Gender. *Taiwan Journal of Linguistics*, *12*(1), 63-79.

Petrosino, L., Colcord, R. D., Kurcz, K. B., & Yonker, R. J. (1993). Voice onset time of velar stop productions in aged speakers. *Perceptual and motor skills*, *76*(1), 83-88.

Piccinini, P., & Arvaniti, A. (2015). Voice onset time in Spanish–English spontaneous code-switching. *Journal of Phonetics*, *52*, 121-137.

Pinho, C. M., Jesus, L. T., & Barney, A. (2012). Weak voicing in fricative production. *Journal of phonetics*, 40, 625-638.

Pinker, S. (1994). The Language Instinct. The New Science of Language and Mind. London (Penguin) 1994.

Pisoni, D. B., & Lively, S. E. (1995). Variability and invariance in speech perception: A new look at some old problems in perceptual learning. *Speech perception and linguistic experience: Issues in cross-language speech research*, 433-459.

Polka, L. (1991). Cross-language speech perception in adults: Phonemic, phonetic, and acoustic contributions. *The Journal of the Acoustical Society of America*, *89*(6), 2961-2977.

Polka, L., & Werker, J. (1994). Developmental changes in perception of non-native vowel contrasts. *Journal of Experimental Psychology: Human Perception and Performance, 20*, 421–435.

Polka, L., & Werker, J. F. (1994). Developmental changes in perception of nonnative vowel contrasts. *Journal of Experimental Psychology: Human Perception and Performance*, *20*(2), 421.

Poon, P. G., & Mateer, C. A. (1985). A study of VOT in Nepali stop consonants. *Phonetica*, *42*(1), 39-47.

Price, C., Wise, R., Ramsay, S., Friston, K., Howard, D., Patterson, K., & Frackowiak, R. (1992). Regional response differences within the human auditory cortex when listening to words. *Neuroscience letters*, *146*(2), 179-182.

Pritchard, S. (2012). A cross-language study of the production and perception of palatalized consonants. (Unpublished doctoral dissertation). University of Ottawa.

Rajashekhar, B. (2013). Vowel Duration across Age and Dialects of Telugu Language. *Language in India*, *13*(2).

Ramsay, G., & Shadle, C. (2006). The influence of geometry on the initiation of turbulence in the vocal tract during the production of fricatives. In *7th International Seminar on Speech Production (ISSP)* (pp. 581-588).

Raphael, L. J. (1972). Preceding vowel duration as a cue to the perception of the voicing characteristic of word-final consonants in American English. *Journalof the Acoustical Society of America*, 51, 1296–1303

Raphael, L. J., Dorman, M. F., & Liberman, A. M. (1980). On defining the vowel duration that cues voicing in final position. *Language and Speech*, 23, 297–308.

Rashid, H. U., & Akhtar, R. N. (2014). A Phonemic and Acoustic Analysis of Hindko Oral Stops. *Acta Linguistica Asiatica*, *4*(1), 9-28.

Reeds, J. A. & Wang, W.-S. Y. (1961). The perception of stops after s. *Phonetica*, 6, 78–81.

Reetz, H. and Jongman, A. (2009). *Phonetics: Transcription, Production, Acoustic and Perception.* West Sussex, UK: Wiley-Blackwell.

Richard, T. and Werker, J. (1984). Cross-language speech perception: Evidence for perceptual reorganization during the first year of life. *Infant behavior and development*, 7, 49-63.

Rochet, B. L., & Yanmei, F. (1991). Effect of consonant and vowel context on Mandarin Chinese VOT: production and perception. *Canadian Acoustics*,*19*(4), 105-106.

Rochet, B. L., & Yanmei, F. (1991). Effect of consonant and vowel context on Mandarin Chinese VOT: production and perception. *Canadian Acoustics*,*19*(4), 105-106.

Sani, M. A. Z. (2005). *Introductory Hausa Phonology*. Kano: Usman Al-Amin Publishers. Nigeria

Schultheiss, K. (2008). Cross language perception of German vowels by speakers of American English. Brigham Young University.

Searl, J. P., Carpenter, M. A., & Banta, C. L. (2001). Intelligibility of stops and fricatives in tracheoesophageal speech. *Journal of communication disorders*, *34*(4), 305-321.

Shadle, C. H. (1990). Articulatory-acoustic relationships in fricative consonants. In *Speech production and speech modelling* (pp. 187-209). Springer, Dordrecht.

Shadle, C. H., Proctor, M. I., Iskarous, K., & Berezina, M. A. (2009). Revisiting the role of the sublingual cavity in the/s/-/ʃ/distinction. *The Journal of the Acoustical Society of America*, *125*(4), 2569-2569.

Shadle, C.H. (2010). Aerodynamics of speech, and the puzzle of voiced fricatives. In Conference on phonetic universals. Leipzig, Germany.

Shahidi, A. H., & Aman, R. (2011). An acoustical study of English plosives in word initial position produced by Malays. *3L: Language, Linguistics, Literature*®, *17*(2).

Sharma, A., & Dorman, M. F. (2000). Neurophysiologic correlates of cross-language phonetic perception. *The Journal of the Acoustical Society of America*, *107*(5), 2697-2703.

Shockley, K., Sabadini, L., & Fowler, C. A. (2004). Imitation in shadowing words. *Perception & Psychophysics*, *66*(3), 422-429.

Skinner, N. (1977). *Anthology of Hausa literature in translation*(No. 7). African Studies Program, University of Wisconsin.

Slis, I. H., & Cohen, A. (1969). On the complex regulating the voiced-voiceless distinction I. *Language and speech*, *12*(2), 80-102.

Slobodan, J. and Saric, Z. (2006). Acoustic analysis of consonants in whispered speech. J*ournal of Voice*, Vol. 22, No. 3, pp. 263-274.

So, C. K., & Attina, V. (2014). Cross-language perception of Cantonese vowels spoken by native and non-native speakers. *Journal of psycholinguistic research*, *43*(5), 611-630.

Soderberg, Craig D. & Kenneth S. Olson. 2008. Indonesian. *Journal of the International Phonetic Association*, 38, 209–213.

Sole, M. J.(2010). Effects of syllable position on sound change: An aerodynamic study of final fricative weakening. *Journal of Phonetics*, 38, 289–305.

Steinhauer, M. H. (2013). Colonial history and language policy in insular Southeast Asia and Madagascar. In *The Austronesian languages of Asia and Madagascar* (pp. 87-108). Routledge.

Stevens, K. N. (1998). Acoustic PhoneticsMIT Press. *Cambridge, MA*.

Stevens, K. N., Blumstein, S. E., Glicksman, L., Burton, M., & Kurowski, K. (1992). Acoustic and perceptual characteristics of voicing in fricatives and fricative clusters. *The Journal of the Acoustical Society of America*, *91*(5), 2979-3000.

Stevens, K. N., Blumstein, S. E., Glicksman, L., Burton, M., & Kurowski, K. (1992). Acoustic and perceptual characteristics of voicing in fricatives and fricative clusters. *Journal of Acoustic Society of America*, 91, (5), 2979-3000.

Stouten, V. (2009). Automatic voice onset time estimation from reassignment spectra. *Speech Communication*, *51*(12), 1194-1205.

Strange, W. (Ed.). (1995). *Speech perception and linguistic experience: Issues in cross-language research*. York Press.

Strange, W., & Dittmann, S. (1984). Effects of discrimination training on the perception of/rl/by Japanese adults learning English. *Perception & psychophysics*, *36*(2), 131-145.

Strauss, M., & Klich, R. J. (2000). Word length effects on EMG/vowel duration relationships in apraxic speakers. *Folia phoniatrica et logopaedica*,*53*(1), 58-65.

Tan, T. P., & Ranaivo-Malançon, B. (2009). Malay grapheme to phoneme tool for automatic speech recognition. In *Third International Workshop on Malay and Indonesian Language Engineering, Singapore*.

Thai, Y. N. (2013). Perception OF 'Voicing among Malaysian ESL Learners. *Malaysian Journal of Languages and Linguistics*, *2*(1), 94-106.

Tomita, M., Noreña, A. J., & Eggermont, J. J. (2004). Effects of an acute acoustic trauma on the representation of a voice onset time continuum in cat primary auditory cortex. *Hearing research*, *193*(1), 39-50.

Tomokiyo, L. M., & Burger, S. (1999). Eliciting natural speech from non-native users: collecting speech data for LVCSR. In *Proceedings of a Symposium on Computer Mediated Language Assessment and Evaluation in Natural Language Processing* (pp. 5-11). Association for Computational Linguistics.

Treisman, M., Faulkner, A., Naish, P. L., & Rosner, B. S. (1995). Voice-onset time and tone-onset time: The role of criterion-setting mechanisms in categorical perception. *The Quarterly Journal of Experimental Psychology*,*48*(2), 334-366.

Tsukada, K. (2005). Cross-language speech perception of final stops by Australian-English, Japanese and Thai listeners. In *ISCA Workshop on Plasticity in Speech Perception*.

Tsukada, K. (2006). Cross-language perception of word-final stops in Thai and English. Bilingualish: *Language and Cognition*, 9 (3) 309-318.

Tsukada, K. (2007). Cross-language perception of word-final stops by multilingual listeners: Preliminary results on the effect of listeners' first language (L1) backgrounds. *Asia Pacific Journal of Speech, Language and Hearing*, *10*(1), 1-13.

Tsukada, K. et al (2004). Release bursts in English word-final voiceless stops produced by native English and Korean adults and children. *Phonetic*, 61, 67-83.

Tsukada, K., & Roengpitya, R. (2008). Discrimination of English and Thai words ending with voiceless stops by native Thai listeners differing in English experience. *Journal of the International Phonetic Association*, *38*(3), 325-347.

Tsukada, K., Xu, H. L., & Rattanasone, N. X. (2015). The perception of Mandarin lexical tones by listeners from different linguistic backgrounds. *Chinese as a Second Language Research*, 4(2), 141-161.

Vuillermet, M., & Demolin, D. (2006). Voiceless implosives: A comparison between American and African languages. In *International Rara and Rarissima Conference: Collecting and Interpreting Unusual Characteristics of Human language, leipzig, Germany*.

Watson, B. C., Baken, R. J., & Roark, R. M. (2016). Effect of Voice Onset Type on Vocal Attack Time. *Journal of Voice*, *30*(1), 11-14.

Wenmin, W., & Zhongmin, C. (2011). Implosives in Uyghur. *Minority Languages of China*, *6*, 014.

Werker, J. and Logan, J. (1985). Cross-language evidence for three factors in speech perception. *Perception and Psychophysics*, 37, 35-44.

Whiteside, S. P., Dobbin, R., & Henry, L. (2003). Patterns of variability in voice onset time: A developmental study of motor speech skills in humans.*Neuroscience Letters*, *347*(1), 29-32.

Whiteside, S. P., Henry, L., & Dobbin, R. (2004). Sex differences in voice onset time: A developmental study of phonetic context effects in British English. *The Journal of the Acoustical Society of America*, *116*(2), 1179-1183.

Whiteside, S. P., Henry, L., & Dobbin, R. (2004). Sex differences in voice onset time: A developmental study of phonetic context effects in British English. *The Journal of the Acoustical Society of America*, *116*(2), 1179-1183.

Wieling, M., Veenstra, P., Adank, P., & Tiede, M. (2017). Articulatory differences between L1 and L2 speakers of English. In *Proceedings of The 11th International Seminar on Speech Production, Tianjin, China, October* (16-19).

Williams, L. (1977). The perception of consonant voicing by Spanish English bilinguals. *Perception & Psychophysics*, 21, 289-297.

Williams, L. (1977). The perception of stop consonants voicing by Spanish-English bilinguals. Perception and Psychophysics, Vol. 21 (4), 289-297.

Xi, C. (2004). The phonetic characteristics of implosives in Wuyang dialect. (Unpublished M.A. Dissertation). The Hong Kong University of Science and Technology.

Xi, C. (2009). A phonetic study on implosives in China. (Unpublished Doctorate Dissertation). The Hong Kong University of Science and Technology.

Xing, H. (2012). On the Origin of Implosive Initials. *Minority Languages of China*, *2*, 005.

Yahaya, I. Y. (1988). *Hausa a rubuce: tarihin rubuce rubuce cikin Hausa*. Kamfanin Buga Littattafai Na Nigeria Ta Arewa.

Yamaguchi, T. & Petursson, M. (2014). Voiceless stop consonants in Malaysian English. *Asian Englishes*, 15,2, 60-79.

Yan, H., & Jiang, D. (2011). Implosive Distribution in East Asian Languages.*Nankai Linguistics*, *2*, 006.

Yanagida, S., Nishizawa, N., Mizoguchi, K., Hatakeyama, H., & Fukuda, S. (2015). Voice Onset Time for the Word-Initial Voiceless Consonant/t/in Japanese Spasmodic Dysphonia—A Comparison With Normal Controls. *Journal of Voice*, *29*(4), 450-454.

Yao, Y. (2007). Closure duration and VOT of word-initial voiceless plosives in English in spontaneous connected speech.

Yao, Y. (2009). Understanding VOT variation in spontaneous speech. https://cloudfront.escholarship.org/dist/prd/content/qt6dd1x6cs/qt6dd1x6cs.pdf

Yeni-Komshian, G. H., Caramazza, A., & Preston, M. S. (1977). A study of voicing in Lebanese Arabic. *Journal of Phonetics*, *5*(1), 35-48.

Yidan, S. O. N. G. (2014). A Phonetic Study on the Voiced Implosives in Wu Dialect of Xianju County, Zhejiang Province. *Dialect*, *2*, 009.

Ying-xiu, X. (2013). Implosives in Chenghai Dialect of the Chaozhou-Shantou Areas. *Journal of the Graduates Sun Yat-Sen University (Social Sciences)*,*1*, 010.

Ylinen, S., Shestakova, A., Alku, P., & Huotilainen, M. (2005). The perception of phonological quantity based on durational cues by native speakers, second-language users and nonspeakers of Finnish. *Language and Speech*, *48*(3), 313-338.

Yu, V. and Andruski, J. (2010). A cross-language study of perception of lexical stress in English. *J Psycholinguist Res*, 39,323-344.

Zhou, X. (2010). Phonetic Implications of Articulation Mechanism of Implosives—Based on Phonetic Analysis of Implosives in Zhuang Language. *Nankai Linguistics*, *1*, 006.

BIODATA OF STUDENT

Jamilu Abdullahi was born in Azare, Bauchi State of Nigeria. After his primary and secondary education, Jamilu obtained an IJMB certificate at the Abubakar Tatari Ali Polytechnic (ATAP) Bauchi in 2003. He furthered his career by earning a B.A. Hausa/Linguistics (second class, upper division) from the University of Maiduguri Nigeria, in 2007. With vast interest in language fields, he proceeded further to accomplish his Master of Arts in Linguistics and African Studies at the International University of Africa, Sudan in 2014. Jamilu is currently pursuing PhD in Applied Comparative Linguistics at Universiti Putra Malaysia.

He has been a lecturer at Bauchi State University, Gadau since 2012; but before his appointment with the University, Jamilu had taught English and Hausa at Dolphin Maria College and Government Day Secondary School, Kafin-Madaki, Bauchi State. He was also a lecturer at Bauchi Institute for Arabic and Islamic Studies, Bauchi State.

His areas of research interest include, phonetics and phonology, morphology, applied linguistics, and prosody. Mr Abdullahi has been a member of the Nigerian Academic Staff Union of Universities (ASUU). He is also a member of the Malaysia Association of Applied Linguistics (MAAL), and Linguistic Association of Nigeria (LAN).

PUBLICATION

Abdullahi, J., Thai, Y. N., Rashid, S. M., & Nimehchisalem, V. (2019). Cross-Language Perception of Non-Native Stops and Fricatives among Malay and Hausa Native Speakers. *Language & Communication*, *6*, 11.

UNIVERSITI PUTRA MALAYSIA

STATUS CONFIRMATION FOR THESIS / PROJECT REPORT AND COPYRIGHT

ACADEMIC SESSION : _____

TITLE OF THESIS / PROJECT REPORT :

CROSS-LANGUAGE PERCEPTION AND PRODUCTION OF STOPS AND FRICATIVES AMONG MALAY AND HAUSA NATIVE SPEAKERS

NAME OF STUDENT: JAMILU ABDULLAHI

I acknowledge that the copyright and other intellectual property in the thesis/project report belonged to Universiti Putra Malaysia and I agree to allow this thesis/project report to be placed at the library under the following terms:

1. This thesis/project report is the property of Universiti Putra Malaysia.
2. The library of Universiti Putra Malaysia has the right to make copies for educational purposes only.
3. The library of Universiti Putra Malaysia is allowed to make copies of this thesis for academic exchange.

I declare that this thesis is classified as :

*Please tick (√)

☐	**CONFIDENTIAL**	(Contain confidential information under Official Secret Act 1972).
☐	**RESTRICTED**	(Contains restricted information as specified by the organization/institution where research was done).
☐	**OPEN ACCESS**	I agree that my thesis/project report to be published as hard copy or online open access.

This thesis is submitted for :

☐	**PATENT**	Embargo from_____ until _____ (date) (date)

Approved by:

_____ (Signature of Student)
New IC No/ Passport No.:

Date :

_____ (Signature of Chairman of Supervisory Committee)
Name:

Date :

[Note : If the thesis is CONFIDENTIAL or RESTRICTED, please attach with the letter from the organization/institution with period and reasons for confidentially or restricted.]