ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

Acquisition of Oromo Phonology by Typically Growing Children

BY

Tariku Negese

A DISSERTATION SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES IN FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

IN

Descriptive and Theoretical Linguistics

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Supervisor: Dr Feda Negesse

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Addis Ababa University
School of Graduate Studies

This is to certify that the thesis prepared by Tariku Negese entitled "*Acquisition of Oromo Phonology by Typically Growing Children*" and submitted in fulfillment of the requirements for the degree of Doctorate of Philosophy complies with the regulations of the university and meets the accepted standards with respect to originality and quality.

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ABSTRACT

This study investigated the phonological acquisition of typically growing Oromo speaking children aged 3;0- 5;11 years. For the study, forty-eight children were selected from the western part of its speakers. Since Oromo lacks information about developmental norms, the study intended to describe the order and age at which Oromo sounds are acquired; patterns followed to acquire clusters, syllable shapes employed at different ages, and the types of phonological processes manifested. An experimentation technique was mainly employed for the data collection using an elicitation method. The speech samples were recorded and transcribed using the IPA symbols and conventions. An Optimality Theory was employed to analyze creative alterations at different ages.

The findings imply that the acquisition of Oromo phonemes comes about relatively early. At age of 3;0 most of the consonants and all the five vowels were acquired although bilabial stop, some alveolars such as fricative, ejectives, and flap were still developing and are refined after the age of 4;0. Evaluating the children's accuracy on the basis of sex at the same age, the study revealed no significant difference among males and females. PVC measures are entirely greater than PCC at all ages, for the participants acquired vowels very early.

An unusual observation arising from this study was children acquiring the language hardly ever reduced word medial clusters at the age under investigation. They often used a strategy of systematic substitution considering the sounds' sonority index. Indeed, they select the second member (C_2) of the clusters (the consonant making an onset of the subsequent syllable) and replace with (C_1) by making some adaptations. The adaptations take two levels of assimilation: complete assimilation at first resulting gemination and reducing the degree of assimilation to partial. Theoretically, this happens when the markedness constraint (CodaConD) outranks faithfulness. In the speech of these children, error patterns arising from their development were mainly sound preference substitution.

As to the syllable, children in this sample were able to produce all the language's syllable shapes and multisyllabic words approximately at three years of age. Normally, the type of speech production patterns noted in the children considered appear to be diversified; most of the patterns are age-appropriate and cross linguistically universal though others are language-specific. For instance, acquisition of most of the phonemes before the age of three is universally accepted even if the acquisition of the language-specific sound (the implosive) occurred very early, contrary to what is anticipated. In addition, patterns of fronting, backing, devoicing, FCD, and lateralization were similarly regarded as universal patterns marked in the language. However, the pattern of making the process eminent was perceived to be language-specific. Generally, the study findings contributed some points to theories of phonological acquisition and universality hypothesis.

Keywords: *Oromo, acquisition, phonological processes/simplification, syllable shape, Cluster*

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I have obtained much support and understanding from many individuals in completing this thesis. However, there are some that ought to have special mentioning. Yet, all the responsibilities for this paper are mine. Most of all, I should thank my God, Lord, and Savior, Jesus Christ who has been so gracious in keeping me well and granting me patience and strength to complete my journey.

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Dedicated to

my mother Marame Wakjira whose strength has inspired me to keep on going and to my late father, Negese Oncho, whom I lost in the middle of this project.

ABBREVIATIONS AND SYMBOLS

/ /	Phonemic transcription
[ ]	Phonetic transcription
Ø	Zero morpheme
1SG	First-person singular
2	Second Person
3SF	Third-person Feminine
3SM	Third-person Masculine
ASP	Aspect
CAU	Causative
DEF	Definite
EMP	Emphatic marker
EPN	Epenthetic
F	Feminine, Female
FCD	Final Consonant Deletion
IPV	Imperfective
M	Masculine, Male
NEG	Negative
ORD	Ordinal
PCC	Percentage of Consonants Correct
PL	Plural
PRV	Perfective
PVC	Percentage of Vowels Correct
SD	Standard Deviation, Sonority Distance
SSP	Sonority Sequencing Principle
T	Total
TT	Total Token

DECLARATION

I hereby affirm that the work presented in this thesis is exclusively my own original work and has not previously been presented to any academic institution in its entirety or partially for any other award or qualification.

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Tariku Negese

July, 2019

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the study

Children do not correctly produce the sounds they will use as adults to some extent because they are physically immature and thus incapable to articulate them with their not fully developed speech organs and somewhat because they may not know exactly what the sound they wish to produce is. Therefore, early researches on phonological development highlighted phoneme acquisition using a segmental approach which contends with the analysis of speech into segmental phonemes. The focus of such studies was to set up norms for the order and age of speech sounds' acquisition of typically developing children. Clinicians have extensively used such normative data in their practice to determine whether a child's speech is typical or delayed and/or atypical. The issue concerns also psycholinguists to explore universal, language-specific, and individual features in acquisition (Saaristo-Helin, 2011). So, these kinds of studies have great importance both for psycholinguists and for clinicians.

The field has been revolutionized by the studies over the years in tandem with different developments in phonological theory (Demuth, 2011) that indicated variation within or between languages to reach a given milestone (Gardner, Pascoe, & Stackhouse, 2006) for special causes grounded in socio-cultural and cognitive contexts (Gardner, Pascoe, & Stackhouse, 2006). It was indicated that children commonly acquire a certain type of sound at approximately similar stages, but with completely different rates, while language-specific elements are the ones eventually acquired (Jakobson, 1968; Dodd, Holm, Hua, & Crosbie, 2003; Fikkert, 2000; Gardner, Pascoe, & Stackhouse, 2006).

This study, as a result, aims to supplement the knowledge of phonological acquisition by describing the typical phonological development of Oromo speaking children. Even if the how of the study diverges, Royer (1995) and Anthony et al. (2003) cited in Dodd, Holm, Hua, & Crosbie (2003) pointed out that the description of children's phonological

development can be considered in two dimensions and progresses. One dimension is the size of the sound unit being acquired and manipulated at a certain stage while the second is the type of alternation of the sound units and the child's ability to recognize the manipulation. Alternation may include substituting one sound for another in a word (for instance, /t/ for /k/), adding or removing sounds from words, blending sounds together to make words. As children develop cognitively and physically the alternations would gradually be eliminated.

Thus, dealing with phonological development of children acquiring a certain language allows exploring the micro linguistic system and the underlying rules of a language like the order of gaining sounds, syllables, methods of simplification, and others. With this aim, this study tried to look into the phonological acquisition of monolingual Oromo-speaking children to fill the gap of linguistic works on the language by providing the size of sounds acquired at different stages and the type of manipulations made in their utterances in relations to the adult target forms. Additionally, it observed the role sex plays in the acquisition process of the language. To this end, both naturalistic sampling and experimentation ways were employed to collect and analyze data obtained from three to five years speaking the western dialect of the language.

1.2. Statement of the problem

Many researchers have published works on the phonological acquisition of children speaking different languages. The studies have described the order and rate of acquisition of phonemes and the developmental phonological processes manifested in children's speeches. A major assumption underlying a great deal of these studies assert that the acquisition of a language has a clear beginning and end state, with a linear path of development for each child (Demuth, 2011; Jakobson, 1968). That means, for example, children living in very different linguistic and social backgrounds will acquire the same set of phonemes possibly at a nearly similar stage. On the other hand, orders of acquisition by children from different language backgrounds or different physical and

cognitive category may differ (San, 2010; Gardin, Henriksson, & Wikstedt, 2014). Children's patterns of error could as well show discrepancy even if the languages acquired have the same phonemes. As a result of the variations, it is important to assess acquisition patterns in order to distinguish specific features exhibited in the speech of children acquiring Oromo.

In addition, since little is known about the phonetic inventory, and phoneme manipulation of Oromo speaking children, normative data are unavailable in the language to make comparisons for speech-language pathologists to set up typical development frameworks. Hence, it is important to understand the nature of phonological development within children of different ages acquiring the language. Other than revealing individual and language-specific features the study may contribute to the universal tendencies in children's phonological acquisition. In spite of this, the survey of local and international studies reveals that no data have been available to date on the phonological acquisition of typically growing children who are acquiring the speech of Oromo.

1.3. Objectives of the study

The main objective of the study is to examine the phonological development of typically developing Oromo-speaking children. Specifically, the study primarily intended to create the phonemic inventory of speech sounds made by the children at different ages. Secondly, the study aimed to examine the percentages of correctly produced segments in the children's utterances to classify the errors made by the children of different ages. In addition, it was wished-for the description of the syllabic structures of words used by the children and the phonological processes taking place in children's speeches. Finally, the study intended to evaluate the accuracy of articulation at the same age in terms of sex. As a result, this study intended to answer the following questions:

1. Which sounds of Oromo are acquired at what age?

2. What are the children's percentages of correct consonant and vowel productions at different ages?
3. What segmental errors do children acquiring Oromo very often make at different ages?
4. What are the most common phonological processes that occur in the speech of children aged 3;0-5,11 years?
5. What are the most common syllabic structures of the children's words at different ages?
6. Does sex affect the acquisition of phonology in typically growing children?

1.4. Significance of the study

This work tried to study facts underlying the phonological acquisition of Oromo speaking children, which possibly is the first attempt in the history of the language's phonological study. In view of this, the outcomes of this study may have different significance generally for language acquisition processes and mostly for Oromo speaking children. Primarily, it can give us an overview of the underlying rules of phonological acquisition manifested in the language. Secondly, it may support clinicians as a normative study for comparison to analyze speech disorders in the language. The findings may also contribute to the current linguistic theories of phonological acquisition as differences in a phonological acquisition may challenge some theories that posit linguistic or biological universals of acquisition. Finally, the study may provide pathways for conducting similar or related further research on the language.

1.5. Delimitation of the study

This study describes how monolingual Oromo speaking children acquire the phonology of the language and how they produce its sounds in different words or morphemes at different ages. Since Oromo has different dialect cleavages, this study restricts itself to typically growing children who are acquiring the Western variety seeing that it is practically impossible to conduct the research on all dialects of the language. The dialect is selected for its convenience for data collection. In addition, it is a dialect used over a

large territory encompassing all zones of Wollega, Jimma, and Illubabor in one cluster as per Feda's (2015) classification. This may slightly contribute to the external validity of the results of the study to a large number of children acquiring the dialect. Finally, the study was focused on monolingual children, only acquiring Oromo. Generally, the study area is specified in FIGURE 1. The figure indicates the location of Ethiopia in Africa, the nine national regional states and two chartered cities of the country. Of these regional states, this study was carried out in the Oromia regional state collecting data from its western part.

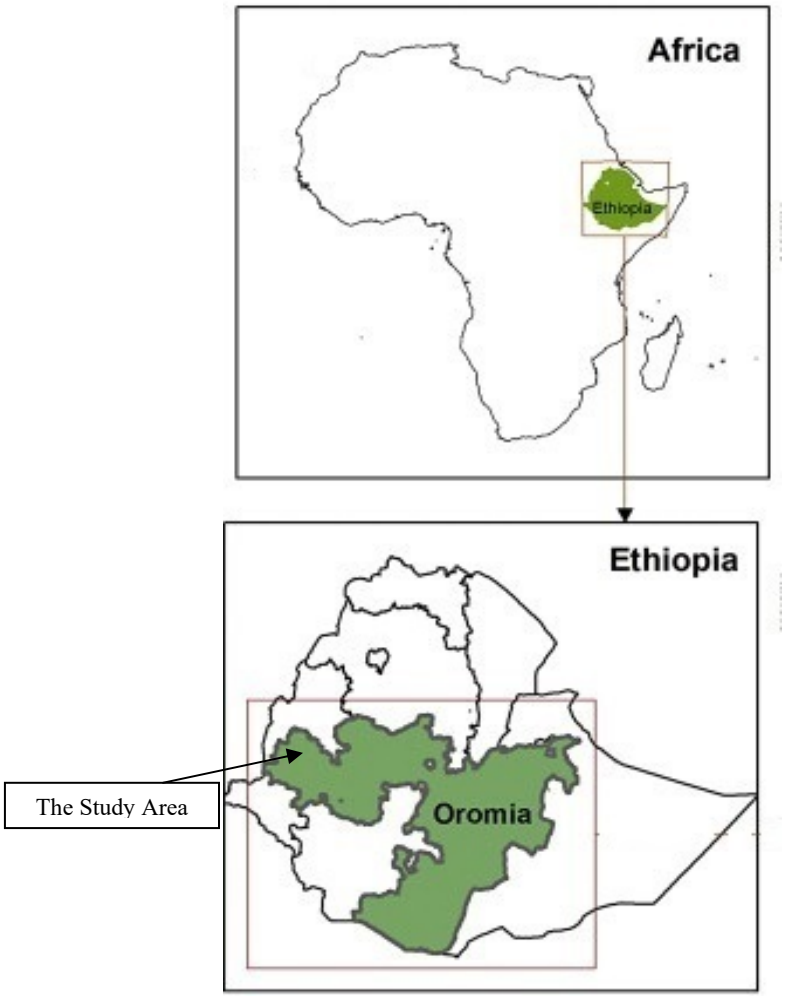


FIGURE 1: Location of the study area
Retrieved and Adapted from:
http://cyberethiopia.com/2013/wp-content/uploads/2016/02/Ethiopia_regions_english.png
and http://www.freeworldmaps.net/africa/ethiopia/location.html On November 13, 2017

1.6. Background on Oromo

Under this subsection, a review regarding the Oromo people and their language is presented. This consists of the historic, geographic and socio-linguistic background, as well as its phonological features in adult speakers as it was presented in previous studies.

1.6.1. The people and the language

Oromo is among one of the five most widely spoken languages of Africa having more than 40 million speakers residing in Ethiopia[1] comprising 50-60% of the country's entire population (Abraham, Huang, & Liu, 2014). The language was genetically classified as East lowland Cushitic of which more than two-thirds of the Cushitic languages' speakers are Oromo (Mekuria, 1995). Considering the current administrative structure of Ethiopia, Oromo speaking people chiefly inhabit within *Oromia* regional state (spelled otherwise as *Oromiya*, which is believed to be a simplified combination of the words *Oromo* (the people) and *biyya* (land), since Oromo often refers to a country as the land of so and such people). Oromos describe their language as '*Afaan Oromoo*' (literally Oromo mouth) even if the term Oromo fairly refers to both the people and the language.

Probably arising from its huge area coverage, Oromo is spoken in diverse dialects (Temesgen, 1993). For instance, taking geographical locations of its users into account scholars like Kebede (2005) and Gragg (1976) listed five dialects in Ethiopia and named the south as Borena, the middle as Tulema, the Eastern as Harar, the Northern as Rayya, and finally the Western as Mecha. On the other hand, Feda (2015) organized Oromo varieties into different dialect groups indicating hierarchies of small and big clusters. As a result, dialects of the language were divided into three big clusters. The first cluster constituted varieties such as Arsi-Bale, Harar, Wollo-Rayya, whereas the second and third, respectively include Wollega-Ilubabor-Jimma, Shawa and Borana-Guji. This

[1] According to Feda (2015) and Mewis (1997) Oromo is spoken not only in Ethiopia but also in some neighboring countries like Kenya and Somalia.

classification is more of systematic than the earlier ones as it normally specifies similarity levels of the varieties. The data collected for this study was totally gathered from children residing in Western Wollega districts and accordingly classified as a study investigating the second cluster variety considering Feda's (2015) classification (see § 1.5 for details).

1.6.2. The phonological features of Oromo in adult speakers

Even if introducing the main features of the phonological system of Oromo in adult speakers is not the main objective of this study, it plays a significant role by providing the reader with an input for concepts to be read in the next chapters, where the main subject matter of the research is treated. The language can be regarded to some extent as languages fairly studied. Hence, various linguistic works tried to look into a detailed or an overview of its phonological aspects; and have listed phonological elements, syllable structure, phonological processes, and prosodies ((Wako, 1981; Benyam, 1988; Abera, 1988; Zaborski & Ali, 1990; Lloret, 1997; Dejene, 2010). Depending on the findings of these phonological works, the section presents a critical review of Oromo phonological systems. Specifically, it discusses the language's phoneme inventories and relevant facts about its pitch, phonological processes, and syllable structures.

1.6.2.1. The phoneme inventories

From the thorough review of these and other pieces of literature, it was observed that the language's segmental phonology was consistently described where the researchers listed 24 native consonants and five vowel sounds. Sometimes one may come across words consisting of sounds like /p, v, z, s'/ in loan words signifying that they are alien sounds (Fikadu, 2014). Most of the consonant phonemes are articulated with pulmonic airstream mechanism; apart from the alveolar voiced implosive /ɗ/ and the ejective sounds /p', ç' and k'/. As can be seen from the summary made in TABLE 1 and 2 no complex phoneme was indicated in the language.

	Voicing	Labials	Alveolars	Palatals	Velars	Glottals
Stops	Voiceless		t		k	ʔ
	Voiced	b	d		g	
Ejectives	Voiceless	p’	t’	ç’	k’	
Implosive	Voiced		ɗ			
Affricates	Voiceless			ç		
	Voiced			ʄ		
Fricatives	Voiceless	f	s	ʃ		h
Nasals		m	n	ɲ		
Lateral			l			
Flap			r			
Glides		w		j		

Table 1: Oromo consonant phonemes

The place-of-articulation categories may appear to be oversimplified from a phonetic viewpoint but are sufficient for a phonological categorization. Labials, for instance, include the bilabial stop /b/, the bilabial ejective /p’/, the bilabial nasal /m/, the labiodental fricative /f/, as well as the bilabial glide /w/. Majority of the consonant sounds have allophonic variation (Wako, 1981; Dejene, 2010). In addition to the consonants, the language possesses five vowel sounds with their long counterparts. Lip rounding and relative tongue position are the defining characteristics of the vowels. Corresponding to the parameter of lip rounding, all the vowels except the two back vowels are unrounded. In the mouth, the general position of the tongue determines the shape of the oral cavity, which divides the vowels into three great classes: (a) front vowels, (b) back vowels, and (c) central vowels. Based on this classification four front, four back, and two central vowels were identified in Oromo (Lloret, 1997). Below is a chart that shows Oromo vowel sounds/phonemes.

	FRONT	*CENTRAL*	*BACK*
High	i, ii	--	u, uu
High-mid	e, ee	--	o, oo
Low		a, aa	

Table 2: Vowel phonemes of Oromo adapted from (Lloret, 1997)

All that TABLE 2 is trying to give you an idea about is where the tongue lies corresponding to the position of the tongue in the mouth when uttering the vowels. It can also indicate the degree to which the mouth is open. Therefore, for example, the front vowel /i/ means that a tongue is in a forward position in the mouth, which is in a more or less closed position. All the vowels are normally distinguished from each other in terms of tongue position and duration or length. Even if dissimilar vowels never coalesce in the language to make a diphthong, similar vowels may combine to bring about a contrastive vowel length in an identical environment. Wako (1981) illustrated distinctiveness of the language's vowel length in Oromo using the following examples.

(1)

[i]	/ɗiba/ 'it lacks'	/ɗi:ba/ 'I/he pushes
[e]	/ʔega:/ 'hence'	/ʔe:ga:/ you (PL) watch'
[a]	/gara/ 'side'	/ga:ra/ 'hill' or 'mountain'
[o]	/bodde:/ 'dirty'	/bo:dde:/ 'behind, later'
[u]	/ɗufu:/ 'to come'	/ɗu:fu:/ 'fart (n)'

As can be seen from these examples, altering the short with a long vowel changed the entire meanings of the words. In addition to these segmental elements, studies agree that the language employs pitch across its words although making a distinction between whether it is a tone or an intonation is a tricky concern. Most previous scholars like Lloret (1997) and Habte (2003) considered the language as purely tone language, while some as pitch accent language (Kebede H. J., 1994), except Dejene (2010).

1.6.2.2. Distributions of Oromo sounds

Consonantal and vowel sounds in Oromo were described so far depending on a systematic review of earlier phonological works. These sounds are labelled phonemes that normally refer to the smallest basic meaning-distinguishing units segmented from the acoustic flow of speech (Bussmann, 1996). Birjandi & Salmani-Nodoushan (2005) defined the term also as a minimally distinctive phonological unit of speech sounds that can differentiate a meaning of words. While coming together, phonemes (in any language) have a definite pattern of an arrangement called phonotactics. The arrangement is deemed to be some constraints on the sequences of phonemes that have to be obeyed in the language (Yule, 2006). For this reason, there are some phonotactic constraints on the possible combination of sounds operating on units larger than its segment like syllable while phonemes come together in Oromo. For example, a cluster of consonant is not permissible both word-initially and finally. All vowels both short and long do occur only in word medial and final positions (Habte, 2003; Wako, 1981) and barred word-initially[2] (Dejene, 2010). That means there is no word that begins with a vowel while in clusters the maximum number of consonant allowed word medially is only two (Hawine, 2007).

The work of Wako (1981) which specifically targets on the Mecha (the western) dialect asserts that from the stop consonants /p'/ does not occur word-initially. Conversely, I encountered words like /p'a:p'alo:/ or /p'a:p'ali:/ 'a type of cranberry bean' and /p'erepp'eramu:/ 'to be scared' in the dialect. Still, Wako (1981) claimed that /s/ does not occur word finally, but in the dialect, I asserted quite the opposite that there are words like /gamas/ 'over there', /ʔakkas/ 'this way' confirming the existence of

[2] Some scholars do not accept the assertion of these former studies due to some methodological reasons and the subject eventually upshots a different topic of debate while identifying the type of syllable shapes in the language.

occurrence where the sound takes a word-final position[3]. Indeed, it appears that the frequency of its occurrence in the position is infrequent. Likewise, the studies stated that /č/ hardly exist in a word initial position. In fact, it seems difficult to find an actual word of Oromo that begins with the sound, but in the language, there are words like /çe:/ 'an expression used to drive donkey'. Besides, there is a proper name /çu:ççe:/, which is mostly a females' nickname. That means even if their distribution is infrequent the sounds may appear in the specified position of a word. /sade:t/ 'eight' and /ʔafur/ 'four' or /ʔeger/ 'a little while' (mostly refers to a time in the afternoon) are presumably some of the only words to finally possess /t/ and /r/ sounds, respectively. All the fricative sounds may come about word-initially or medially apart from the glottal fricative /h/, which is restricted to the initial position only (Wako, 1981). In fact, word medially the sound serves sometimes as a free variant of the glottal stop. For instance, /naʔe/ 'he's startled' can be surfaced as [nahe] alternating the stop with the fricative.

Majority of the words in Oromo end in vowel sounds although some consonants such as /m, n, r, s, f/ more frequently occur word-finally than other consonants (Habte, 2003). With the exception of these sounds, all the non-loan consonant segments, except /c, w, ʔ, ɗ/, may occasionally occur word-finally in idiophone expressions (Dejene, 2010). From the affricates, no sound is attested taking the word-final position; but all the nasals excepting the palatal nasal sound (which does not occur word-finally) can take word-initial, medial, and final positions. Only about 29.2% of the consonants takes a word final position while the entire consonant sounds can occur word-initially and word-medially; excepting the restriction of the glottal fricative to word-initial position. The following table summarizes the occurrences of the sounds in different word positions.

[3]The sound takes word-final position mostly as a morpheme indicating repetition or providing supplementary idea.

Sound	Occurrences			Sound	Occurrences		
	initial	**Medial**	**Final**		**initial**	**Medial**	**Final**
/b/	√	√		/l/	√	√	√
/p'/	√	√		/m/	√	√	√
/ʔ/	√	√		/n/	√	√	√
/d/	√	√		/ɲ/	√	√	
/ɗ/	√	√		/k'/	√	√	
/g/	√	√		/r/	√	√	√
/č/	√	√		/s/	√	√	√
/č'/	√	√		/t/	√	√	√
/f/	√	√	√	/w/	√	√	
/h/	√			/t'/	√	√	
/j/	√	√		/j/	√	√	
/k/	√	√		/ʃ/	√	√	

Table 3: Occurrence Possibilities of Oromo sounds in different word positions

1.6.2.3. Phonological processes in Oromo

When phonemes come together in a logical order (according to the language's phonotactics) various phonological changes may take place ensuing phonological processes such as assimilation, deletion, epenthesis, metathesis, and dissimilation. Assimilation is a process whereby two usually neighbouring sounds become more related to each other in a particular feature and environment (Carr, 2008). The resemblance can be in terms of place or manner of articulation or voicing state. It is the most common phonological process in Oromo that mostly occurs "… contiguously and mainly at word or morpheme boundaries, hence mainly morpho-phonemic in nature" and has many different kinds (Devardhi & Dejene, 2013) depending on the resembling feature. Labialization, palatalization, velarization, glottalization, and deglottalization are some of the types of assimilation processes based on resemblance of voicing state, or place or manner of articulation. It takes place in the language in diverse environments by

a segment to become phonetically more similar to the neighbouring segment (Tilahun, 2014).

There are two types of assimilation in terms of direction named as progressive and regressive. In the first cluster of Oromo dialect, for example, Devardhi & Dejene (2013) indicated that the voiceless alveolar stop /t/ regressively and totally assimilates to voiced velar, alveolar and bilabial stops /b, d, g/ and becomes [d] as indicated in the following attestation.

(2)

a.	/ç'ab- t- Ø - e/		[ç'abde]
	break- 3SF/ 2- SG- PRV		*'She was/you were broken.'*
b.	/fid- t- an/		[fiddan]
	bring- 2- PL: PRV		*'You brought.'*
c.	*/fi:*g- *t- Ø- e/*		*[fi:*g*de]*
	run- 3SF/ 2- SG- PRV		*'she/you ran.'*

(Devardhi & Dejene, 2013)

On top, the alveolar nasal, /n/, assimilates in its place to the immediately following consonant within a word or when a prefix /hin-/ is attached to words beginning with stops (/b, m, k, g/), ejective (/k'/), fricatives and liquids (/f, l, r/), and semivowels (Tilahun, 2014). In these situations, the sound could be changed to sounds [m], [ɱ], [ŋ],[l], and [r] depending on the subsequent sound. Other than what is listed by Tilahun

(2014), the implosive sound may totally assimilate to [n] when the emphatic[4] marker prefix /hin-/ is attached to a word beginning with an implosive sound as in (3).

(3)

a.	/hin-*ɗak'*-a/	[hinnak'a]
	EMP-*go*-ASP	It/he goes
b.	/hin-*ɗukkub*-a/	[hinnukkuba]
	EMP-*sick*-ASP	S/he is sick
c.	/hin-*ɗungat*-a/	[hinnuŋgata]
	EMP-*kiss*-ASP	It/he kisses

Note that prefixes ending with a consonant like the emphatic/negative marker may have the possibility of occurrence with every consonant sound occurring in a word-initial position.

As a rule, by the process of assimilation, a segment adapts at least one feature of a neighbouring segment to make the articulation easier, which is characterized by four parameters: affected sounds (targets), triggering sounds (triggers) phonetic features

[4] The function of /hin-/ in the language is not only serving as an emphatic marker but also as a proclitic negative marker (Wakweya, 2014; Dejene, 2010). For example, Wakweya (2014) analyzed the word [hinrafne] as:

hin-raf-n-e

NEG- sleep-NEG-PRV, whereby he tagged the morpheme as negative marker. Similarly, Dejene (2010) indicated the function of the morpheme the way indicated using the following illustration.

/hin-*ja*:*d*- Ø-u/	[hijja:du]
NEG-think- 1SG/3SM -NEG - IPV	'I do not/he does not think.'

(aspect affected), and direction. Equally, dissimilation is a phonological process that makes sounds more dissimilar or different from the neighbouring segment in order to make easier for a hearer to distinguish individual sounds. This is a case in which "a long syllable of a suffix becomes short when affixed to a stem ending with a long syllable" (Fikadu, 2014) or vice versa in Oromo when derivational affixes are attached to them as can be observed in (4).

(4)

a.	/fi:g-*sis*-Ø-e/	[fi:gsise]
	run-*CAU*- 3SM/1SG – PRV	"I/he caused (someone) to run."
b.	/mur – *si:s* - e/	[mursi:se]
	cut - *CAU* - PRV	'He made cut.'
c.	/ho:la: - ota/	[ho:lota]
	sheep - pL	sheep (PL)

*(*Dejene, 2010)

In this case, the root word /fi:g-/ 'run' has a long vowel, while the affix has a short vowel, but in the following example, the root has short vowel while its affix is composed of a long vowel in its surface form (see example 5).

(5)

/mur - sis - e/	[mursi:se]
cut - CAU - PRV	'He made (someone) cut.'

(Dejene, 2010)

Read Fikadu (2014) for the details on dissimilation in Oromo. It is also pointed out that deletion, epenthesis, and metathesis are the phonological processes considerably employed in the language. While two non-identical vowels coalesce at morpheme

boundary, one of the vowel sounds would be removed from the structure resulting in the process of deletion (Habte, 2003) as illustrated in 6.

(6)

a) /nama–içça /	[namiçça]
man-DEF[5]	'the man'
b) /harre: – o:ta /	[harro:ta]
donkey-PL	'donkeys'

(Habte, 2003)

Epenthesis is the other phonological process, which adds originally non-existing sound to a word with the intention of correcting impermissible clusters. Owing to the impermissibility of more than two consonants at the middle of a word, for example, the language inserts an epenthetic vowel to reduce the clusters as shown in EXAMPLE 7.

(7)

a) /darb - i - t - e/	[darbite] /[dabarte]
Pass- EPN- 2SG/3SF - PRV	'She passed.'
b) /ç'ab -s - i - t - e/	[ç'absite]
break -CAU- EPN-2SG/3SF - PRV	'She/you broke.'

(Dejene, 2010)

[5]Even if, this claim needs further morphological investigation, it seems to me that definiteness is marked unclearly in Oromo. Therefore, it apparently looks a synthetic morpheme composed of both definiteness and gender (masculinity). For example, consider a word /barsi:sa:/ 'teacher' and affix the morpheme; you will get a well-formed word /barsi:sičča/ 'the teacher (Masculine)'. On the other hand, a use of /barsi:stu:-ičča:/ to convey a corresponding meaning with a feminine gender makes it ill-formed and obliges to change the entire morpheme /-ičča/ into /-t-uttii/, and becomes /barsi:stutti:/ or /barsi:ftutti:/ 'the teacher (Feminine). That means femininity disregards this morpheme due to variation of the gender, which indicates that the morpheme is not merely marking definiteness.

The other phonological process is deletion which happens by omitting an initially existing sound in a word. In Oromo, this phonological process mostly happens with vowels during affixation at word (morpheme) boundary (Dejene, 2010) as indicated in 8.

(8)

a) /nama–içça /	[namiççа]
man-DEF	'the man'
a) harre: – o:ta /	[harro:ta]
donkey-PL	'donkeys'
	(Habte, 2003)

As can be seen from the example, one of the vowels removes the other when non-identical vowels come together in favour of the language's co-occurrence constraints. Additionally, adjacent segments may interchange their position within a word for a variety of reasons. The process results in metathesis. In Oromo, it occurs sporadically to correct an impermissible sequence of segments. Due to co-occurrence restriction on consonants, cluster of consonants like /gl/ and /fr/ will be changed to [lg/ and [rf], respectively as illustrated in (9).

(9)

a) /sagal–affa:/	[salgaffa:]
nine ORD	'nineth'
b) /ʔafur-affa:/	[ʔarfaffa:]
four-ORD	fourth

(Dejene, 2010)

Note that after the affixation of the ordinal marker, /a/ and /u/ sounds became deleted to let the consonants occur in clusters. Owing to the restriction indicated, however, the process of metathesis takes place.

1.6.2.4. The syllable template

Phonemes in a language team up in a structured way to form a syllable of varied segment combinations. In Oromo, almost all studies except Melaku (1980) provided similar core syllable types. Melaku (1980) stated that V, VC, CV, and CVC are the only possible syllable types in the language. Indeed, this finding falls short of considering the reality of vowel length in the language and seems imprecise.

Therefore, disregarding this work, the attested four possible basic syllable patterns in Oromo, according to some later studies, were listed[6] (see example 10). The syllable shapes referred to in the examples are in bold print.

(10)

No.	Syllable Type	Example	Gloss
1	CV	[**ɗa**.ɗaː]	'butter'
2	CVV	[sil.**miː**]	'tick'
3	CVC	[**ʃan**]	'five'
4	CVVC	[**foːn**]	'meat'

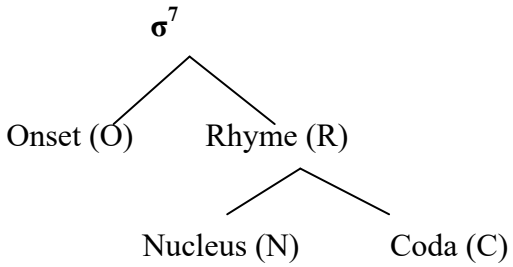
The patterns entirely indicate an obligatory onset consonant. The maximal size of the syllables is a syllable with CVVC structure, where C is a consonant and VV is a long vowel. One condition on a well-formed word in the language is that it has to be made up of at least one syllable with a structure CV, a syllable containing an initial consonant and ends in at least a vowel. However, studies reveal that Oromo is among languages with minimal word requirements with a syllable CVC template (Gordon, 2006) not the CV

[6] The number of syllables in Oromo is yet contentious due to varied descriptions with words orthographically beginning with vowels. The listed syllable types in example 10 entirely possess an onset consonant; an argument that deems existence of a glottal stop with words orthographically beginning with vowels (See example 9 (b)) although others do not accept. This counter claim doubles the number of its types. So, an instrumental study is needed to provide evidence for settling the debate with such words.

arrangement. Therefore, these sounds are indispensable elements in the language. For the majority of the words in Oromo, however, there are no less than two syllables.

In view of a syllable's internal structure, it is often said to be classified into onset (a consonant that comes before the nucleus) and the rhyme (a part composed of the nucleus (that is a vowel) and an optional consonant following the nucleus). The rhyme can be further subdivided into the nucleus and the coda (a consonant following the nucleus). For instance, in the obligatory syllable structure of Oromo, the consonant is referred to as Onset; while the vowel is a nucleus that makes part of the rhyme. Since no syllable begins with a vowel both onset and nucleus are obligatory elements while coda is optional (a glottal stop occupies the onset position as an epenthetic consonant in the surface form to fill the gap when words seem to begin orthographically with a vowel). The syllables differ in shape, size and weight since the number of consonants and vowels they may contain can be different. Therefore, the number of segments can vary from two to four and their structural arrangement in a syllable can be depicted as in (11).

(11)



The onset obligatorily possesses a consonant while the nucleus obligatorily possesses at least a vowel. Coda is a place for an optional consonant although possession of more than one consonant is impermissible. So, the syllable structure of Oromo can be further described using a formula $C_{(1)}V_{(1-2)}C_{(0-1)}$. Habte (2003) stated that when a word ends with a closed syllable (a syllable ending with a consonant) the consonant occupying the coda position can be one of the segments /n, l, r, m, s, f/ in Oromo. Consonants other

[7] A syllable is conventionally marked as σ (the small Greek letter sigma).

than /h/ and /ʔ/ can occupy the coda position in other environments; but the syllable onset in any position can be any of the consonant sounds (Habte, 2003).

No matter the dialect and the number of syllables a word is composed of, syllable boundaries are instantly recognizable, in Oromo. A procedure in the syllabification of Oromo words is founded on three-step algorithms that disambiguate the position of each segment within the syllable structure. Firstly, from the transcription of the word to be syllabified, vowel(s) will be identified and after that, the vowel(s) will be attached to a preceding onset consonant. Finally, (if available) the remaining consonant not followed by a vowel will be placed in a coda position. This algorithm works on the restriction that Oromo allows only one consonant in the onset and coda position. Additionally, a consonant preceding the vowel is a requisite sound that goes into the onset position while the coda optionally occupies a consonant. So, in the language, any discrepancy of its rules with loan words like the English word 'Sport' that begins and ends in a consonant cluster (the rule Oromo under no circumstances favours in the structure of its syllable formation) could be adjusted corresponding to the core syllable structures. Regarding the language's techniques of adaption with such words, Habte (2003) consequently wrote the following.

> *...word initial and final clustering is not possible in the language; and in connection to this no core syllable with CC onsets or CC codas are possible. As a result, the /s/ of sp cluster is splitted and goes to the preceding epenthetically formed nucleus and the /p/ goes to the following nucleus. In the same manner, /r/ splits up from rt cluster and goes to the preceding nucleus; and /t/ goes to the final vowel.*

1.6.2.5. Clusters of Oromo consonants

In Oromo, consonant clusters are not permitted both initially and finally; even as all the sequences are bi-consonantal due to impermissible sequences of more than two consonants (Lloret, 1997). Yet, there are some constraints on the consonants while occurring in word medial position as clusters. Wako (1981) grouped consonants of the language occurring in a cluster into four depending on their occurrence restrictions. These are consonants making first member (C_1), second member (C_2), both second and first member (C_1&C_2), and finally, consonants never occurring as a cluster. With this classification majority of the phoneme sounds characterized under each of the groupings are acceptable although a few phonemes are miscategorised. For example /w,h/ are consonants sorted as phonemes never occurring as clusters; but it is difficult to generalize since some morphological processes may ensue co-occurrences as in the case of [ʔofwalla:lu:] 'fainting'.

In addition, /n/ was speciously regarded as a phoneme that "[does] not combine with any other consonant phonemes as [a] second [member] to form cluster" (Wako, 1981). In the language, words like /fač'a:sne/ 'we sowed', /k'abna/ 'we have', and /humna/ 'power' are some of the words I encountered with the sound in a cluster as a second member (C_2). In essence, the language has only some types of consonants to occur in a cluster. With this review, only nine sounds checked out of the entire consonantal phonemes can make the first member (C_1) although the number of the second members may exceed the listed sounds. /n,r,l/ are the most common first members whilst /t,d,ç,j,ʔ,t,ɗ,h,ʃ,w,j/ and /n,h,ʃ,w,j/ don't, respectively make the first and second member (Habte, 2003) while /d,ʔ,č,ʃ/ do not make up the first member. Presumably, /l/ and /r/ are the sounds frequently occurring with different sounds followed by /n/ making a first member; they can normally happen with at least half of the other consonants of the language.

CHAPTER TWO

2. REVIEW OF RELATED LITERATURE

2.1. Introduction

This chapter sets up the framework and basis within which the current study was conducted by defining some key issues related to child phonology. As a primary goal, it outlines a more comprehensive discussion of various conceptual and theoretical works on the phonological acquisition. In particular, a review of theories of acquisition, viewpoints in the study of phonological acquisition (particularly Optimality Theory), factors affecting the acquisition, patterns of acquisition, and concise previous studies on phonological acquisition are discretely discussed.

2.2. Previous works on phonological acquisition

To decide the nature and course of phonological acquisition scholars normally used two main techniques: longitudinal and cross-sectional. As the name suggests, longitudinal studies take a long time to carry out which usually involves following a few children for a certain period of time to get comprehensive information within the time period (O'Grady & Cho, 2011). Alternatively, cross-sectional studies engage a large sample of children of various ages (Dodd, Holm, Hua, & Crosbie, 2003).

Longitudinal studies mainly focus on describing how phonemes are acquired and spread through the child's lexicon, while cross-sectional studies typically focus on the accuracy of production by a certain percentage of participants at each age level (Trudeau, Macleod, Sutton, & Thordardottir, 2011). Both techniques have their strengths and limitations and are able to complement each other in providing rich and valuable information about children's phonological development (Trudeau, Macleod, Sutton, & Thordardottir, 2011).

In the following section, some longitudinal and cross-sectional works on child phonological acquisition were reviewed. Most of the studies on the acquisition of child

phonology by means of both techniques were actually conducted on Western languages, especially on English children. With the review made in this study, no longitudinal work can be cited on Ethiopian languages except the cross-sectional work by Abebayehu & Demeke (2017). The studies reviewed, as a result, are findings on different languages of the world associated with phonological development at different ages.

2.2.1. Longitudinal studies

Many investigations of children's phonological development have been observational case studies, where longitudinal data is collected and developmental trends were assessed (Demuth, 2011). English is one of the languages deeply studied with the technique. Dodd (1995), for instance, studied a phonological development of five children speaking the language from 20 to 36 months. She investigated speech errors made by the children and she observed that all children made assimilation errors. In addition, cluster reduction was a more influential phonological process, operating to maintain a CV syllable structure.

Kunnari, Nakai, & Vihman (2001) looked at the acquisition of geminate consonants in children acquiring Finnish and Japanese over the course of the one-word period. The two languages are said to have phonologically contrastive lengths for both vowels and consonants (Kunnari, Nakai, & Vihman, 2001). They collected data longitudinally from two groups each acquiring one of the languages. The first group consists of 10 participants acquiring Finnish and the other group consisting of five participants acquiring Japanese. All the children came from monolingual homes and had typical developmental histories. Hence, they looked at the difference between singleton and geminate consonants of children's production against adult speakers of the languages. Consequently, they measured the duration of the first vowel, stop consonant, and final vowel of disyllables produced by children and evaluated them with similar segments produced by adults. Their findings revealed that Finish children acquire geminates and distinguish the contrast more rapidly than Japanese-speaking children. The evident cause

for the cross-linguistic difference was suggested to be the difference in input frequency, and the degree of consistency in the segmental lengths to which they are exposed.

Hua (2002) has also undertaken research on Putonghua (a Modern Standard Chinese) to investigate the phonological acquisition of 129 monolingual children speaking the language. In her work, the children were recruited from five nurseries and kindergartens in Beijing to be individually assessed. The material used for elicitation purposes were picture naming and picture description tasks. The choice of the target words was mostly motivated by their familiarity to young children and the capability to produce the pictures. The findings revealed that children mastered elements of the language's syllable (tone, syllable initial consonants, vowels, and syllable final consonants) in discrete orders, i.e.; tones were acquired first; after that syllable-final consonants and vowels; while syllable-initial consonants were acquired last. By three fourth of the participants, acquisition of 21 syllable initial consonants was fairly complete at 3;6 and by the remaining fraction completely uttered on two third occasions at 4; 6 (excepting four affricates). Consistent with Jakobson's Law of irreversible solidarity the children acquired nasals before orals and stops before fricatives, but front consonants such as /p, p^h, m, f/ were acquired at the same stage as back consonants. The language has three alveolo-palatal sounds; the very uncommon sounds in the majority of the world's languages. Three fourth (75%) of the children acquired the sounds at two and a half years. Possibly, due to its role in distinguishing lexical meaning, children's tone errors were uncommon. Structural simplifications such as assimilation, deletion, and reduction, and systemic substitutions such as stopping, fronting, backing, gliding were manifested in Putonghua-speaking children that are similar across languages (Hua, 2002).

In African languages, Demuth and Tuomi, Gxilishe & Matomela cited in Gangji, Pascoe, & Smouse, (2014) have done a few longitudinal studies, respectively on Sesotho and isiXhosa languages. The work of Demuth (2007) which is one of the longitudinal works to be mentioned on African languages has drawn its data from 98 hours of spontaneous speech samples of four children acquiring Sesotho (a southern Bantu

language spoken in Lesotho). The participants were aged 2,1 to 4,7 who were tested for the acquisition of most aspects of phonology including consonant, vowel, tone, and phonological processes. Her finding revealed that most simple consonants have been acquired by the age of two while they simplify co-articulated sounds. The most difficult consonant for children speaking Sesotho is found to be the palatal-alveolar click /!/ which is mostly realized as /k/ within a word until around the age of 3, but the children correctly preserve the aspiration of the sound. Here note that they do perceive the right aspiration, which is phonemic in the language, even though they do not accurately utter the sound. With regard to vowels, its acquisition seems to be achieved quite early although children might have some difficulty distinguishing the vowel height. At 3 years and above, Sesotho acquiring children have quite a great deal of phonological processes that yet causing a problem. Surprisingly the acquisitions of high and low tones seem to be completed by the age of two indicating the early acquisition of pitch across words: a finding consistent with the findings of Hua (2002).

2.2.2. Cross-sectional studies

There are a significant number of cross-sectional studies on the phonological acquisition. Arabic is one of the languages tested for its acquisition pattern in the technique by Amayreh & Dyson (1998). They administered an Arabic articulation test to 180 participants aged between 2:0 and 6:4. All the participants were typically developing and they were divided into nine different age groups. They also classified the age of acquisition into the age of customary production, age of acquisition, and age of mastery. In the age of customary production, correct production of the sound in at least two-word positions is expected by at least 50% of the children in the group. Similarly, correct production of the target sound in all positions is expected for the acquisition and mastery ages by, respectively 75% and 90% of the children in an age group. They reported that medial consonants were significantly more accurate than initial and final ones. Besides, ages of acquisition of Arabic consonants were similar to those for English except for the stops and nasals. The Arabic children have acquired these sounds earlier than English-speaking children. Specifically, the consonants /f, t, l/ were acquired earlier

in Arabic than in English, while /h, d, j/ were later in Arabic than in English. The work also reported the percentages of correctness for consonants that showed clear developmental trends. As the child grows older, its mastery of speech sound gets better and the number of phonological processes made lessens.

Dodd B. *et al.* (2003) studied 684 children aged three to six years acquiring English; the sample contained 326 boys and 358 girls. They considered each child individually using tests from the Diagnostic Evaluation of Articulation and Phonology (DEAP) to evaluate the children's speech abilities. With the assessment test, a child's ability to produce individual speech sounds, either in words or in separation was examined by establishing the child's phonetic inventory. They made the children to name 30 pictures where the majority of the target words have CVC syllable structure. In their work, they investigated the age of phonological development and errors elimination resulting in superior articulation accuracy for the older children than the younger ones. In the younger age, there is no difference between the two gender groups while in the older ages girls' phonological accuracy was better than that of the boys. Moreover, the socio-economic status revealed no significant effect on the phonological development of the children. The findings also revealed that /m, n, p, b, d, w/ are the sounds of English acquired early while sounds like /r, h, ð/ are acquired later, even as /č/ is the sound attested to have been acquired last. At the age of six, 90% of the children, articulated errors free utterances even as gliding persisted after six years with most children.

Gxilishe (2004) studied the nature of click inventory and the order of emergence for the consonants in isiXhosa. In the study, ten children (three males and seven females) between one and three years participated to reveal the course of development and differentiation of a phonological repertoire. Spontaneously connected speech samples in home environments were used to collect the data for the study. The finding showed that the children began to acquire all three types of clicks between 1,0 and 1:6 years of age. This means the children acquired the language-specific sounds earlier than some of the

other language universal sounds. From the clicks, the first sound to emerge between 1;0 and 1;6 years is the alveolar /l/, followed by the palatal /!/ sound and lateral /ll/.

Trudeau, Macleod, Sutton, & Thordardottir (2011) also investigated consonant acquisition, inventory, and accuracy of 156 French-speaking children ageing 1;6 to 4;5 years and then compared the findings with the same findings in English. The children's language abilities were examined systematically in an independent project. To elicit the target 40 words representing all consonants in three-word positions, they used a picture-naming task. The analysis was made at five levels: phonetic inventory, consonant accuracy, consonant acquisition, and comparison of the inventory to the acquisition, and comparing the finding with similar findings in English. From the findings, it was observed that more consonants appear at the word-initial position at earlier ages followed by word-medial position, and then word-final positions. Consonants underwent an enormous change before 3 years and achieved stability towards 3; 6 years. /t, m, n, z/ are the early consonants acquired before 3 years, then /p, b, d, k, g, ɲ, f, v, ʁ, l, w, ɥ/ are the consonants acquired at and before 4;6 years. Yet, /s, ʒ, ʃ, j/ were the other four consonants acquired after 4; 6 years. From the comparison with English data, some language-specific patterns that influence the rate and order of phonological acquisition appeared. The result from the statistical analysis of consonant accuracy revealed significant differences across the age ranges. Consonants were acquired gradually and mastered across word positions. From the comparison with a similar study in English, various differences in the acquisition were examined that, according to the researchers, probably emanates from the phonetic details of the two languages.

Similarly, Gangji, Pascoe, & Smouse (2014) studied Swahili-speaking children ageing three to five years to recognize the typical phonological development of the language. By means of a convenience sampling, a cross-sectional technique was designed to collect data from twenty-four (12 boys and 12 girls) typically developing children. The Diagnostic Evaluation of Articulation and Phonology (DEAP) was used as a basis to develop the master single word list in Swahili. In addition, a picture booklet was

developed for naming using the black and white line drawings. When a child was unable to name the pictures an imitation task was employed. The findings of this research revealed that all Swahili vowels and most of the consonants are acquired by three years of age. The phonemes /θ/ and /r/ were found to be among the last sounds acquired by the children only by 5; 11 years. She also investigated that as children grow older they tend to produce speech sounds more accurately and use less phonological processes in their speech.

Maphlala, Pascoe, & Smouse (2014) also conducted research on isiXhosa to describe typically developing children's phonological development. For this descriptive cross-sectional design was employed to include 24 children with disproportionate gender share among the children for the study excluded considering the issue as a factor. Taking into account availability and willingness, convenience sampling was used to select the participants. To discover or exclude any structural or functional defects, an informal oral-peripheral evaluation (OPE) checklist was used. In the findings, the children had acquired majority of the consonants and all vowels by three, but clicks and affricates showed inconsistency across the groups and are evidently the last consonants to be fully acquired opposing the findings of Gxilishe (2004); the work claimed that the acquisition of clicks emerged earlier than the other sounds. PCC and PVC scores for these children in each group ranged between 90% and 100% suggesting the highest accuracy approximating the adult targets in their productions. De-affrication, substitution, and vowel assimilation (which seems specific to isiXhosa speaking children) were the most commonly used phonological processes. Complex syllable shapes also appeared relatively early in their speech.

Gardin, Henriksson, & Wikstedt (2014) studied 13 Swedish-speaking children aged two years. In the study, the consonantal list of Swedish was investigated and the result was compared with English at the same age. Participants in the study were 13 children (seven girls and six boys) with a mean age of two years. The data collected from these children was analyzed by means of an independent analysis method with IPA as a

standard. Statistical significance was also measured using an independent one-sample t-test in SPSS. Hence, the findings showed that nasals are commonly acquired closely followed by voiced plosives. There is also a consistency of consonantal inventory in both word-initial and final positions with the studies compared.

In this study, the only study reviewed on Ethiopian language is that of Abebayehu and Demeke (2017). The study, described aspects of phonological developments in children speaking the Sidaama language (referred to in the study as Sidaamu Afoo), one of the Cushitic languages, collecting data from six children aged between 3;6 and 4;9 years. The study tried to describe features of the phonological patterns exhibited in monolingual children acquiring Sidaamu Afoo. The study's description concentrates on the developmental deviations made by the children and listed seven phonological simplification strategies made by the children. The study, as a whole, indicated existences of similar cross-linguistic patterns, but some simplification strategies such as fronting (replacing of the velar ejective with the alveolar counterpart, for example) was considered as language-specific. In addition, the study regarded backing of the alveolar fricative to its post-alveolar corresponding sound and deaffrication at the age of 4;9 as phonological delay while de-glottalizaton (termed in the study as de-ejectivisation) and complete distortions like changing the implosive into pulmonics, ejectives and clicks (they termed as de-implosivisation) patterns were seemingly considered as age inappropriate.

2.2.3. Digest of the studies

In the studies reviewed, differences exist between the sample size, age of children categorized, data collection methods and aspects examined. Not only had these but their findings also revealed many inconsistencies across languages and studies. Equally, not all the studies analyzed and reported every aspect of language elements. Comparatively, consonants attracted more attention than vowels, consonant clusters, and prosodies. In cross-sectional studies of child language development, a few studies reported the age of vowel acquisition. Some of the literature on vowel development, however, suggests that the vowels of a language are acquired early.

Both longitudinal and cross-sectional studies of typical phonological acquisition also present evidence of similarity on the status of some sounds but variability in production within children. The findings come out in accord on the fact that certain sounds develop earlier than others do. For instance, nasals, stops and glides were acquired early in many of the languages tested; fricatives and affricates were mastered relatively late. Stops, nasals, glides, palatal fricatives and affricates were acquired earlier as compared to alveolar and dental fricatives. Some language-specific sounds and tone do appear approximately at three years of age (Hua, 2002; Demuth, 2007).

Normally, as children get older their sound production becomes more accurate and there are less phonological processes (phonological deviations) (Gangji, Pascoe, & Smouse, 2014). Due to the deviations, speeches of children were often characterized entirely by various mismatches between the realization and the input (adult speech) (Dodd B. , 1995). The variances stem from the processes revealed in universal tendencies and language-specific constraints on acquisition (Fikkert, 2007). Phonological processes that are expected for a typically developing speech have been identified in a range of different languages and have been detailed within the age 2;0 – 7;0 years. Results from cross-linguistic studies also suggest that children's early word productions are sensitive to language-specific phonologies.

Moreover, the studies made a distinction between 'customary production' and 'mastery'. In fact, the criterion used in defining the age of acquisition was either not clearly defined or varied from one study to another. The criterion of either 75% or 90% of the children producing the sound correctly in three-word positions was commonly used (Dodd, Holm, Hua, & Crosbie, 2003). However, Sander used the range of 50% of the children producing the sound correctly in two-word positions as the age of customary production and 90% of the children producing the sound correctly in three-word positions as the age of mastery production to reflect the continuum of sound acquisition (Sander, 1972).

2.3. Issues in phonological acquisition

Phonology examines the organization and structure of sounds within a particular language (Nathan, 2008) and tries to find out how phonemes are organized and used in languages. It includes the identification and operation of phonemes to form words and the correct intonation patterns employed for phrases and sentences. So, the study of phonological systems looks into rules, which specify how the phonemes interact with each other (Birjandi & Salmani-Nodoushan, 2005). Hence, when we refer to the study of phonological acquisition in children, the focus is on how children gain the phonological system of the ambient language(s); how they manage to produce contrasts between phonemes and learn the rules to combine the phonemes in words (Demuth, 2011). Child phonology also studies usually patterns in production and discover plain facts, such as the divergence of their production from the adult target and its systematic nature (Fikkert, 2007).

Unlike learning, acquisition is a gradual ability development by naturally making interaction in a communicative situation with the language-users (Crystal, 1997) and mostly refers to the process of gaining first language (Crystal, 2008). On top, "acquisition is a subconscious process… [Where] the acquirer is always aware of it, and he or she is not usually aware of its results" producing Chomsky's 'tacit competence' (Krashen S. D., 1989). Conversely, learning is a progression of accumulating knowledge in an institutional setting (Yule, 2006). It is also a conscious knowledge with a practice of error correction (Krashen S. D., 1989).

Again, the issue of 'what is acquired' is a difficult one; in the past, it has been operationalized in diverse ways. That is to say, how one defines, acquisition depends on what he/she is probing. This might range from linguistic knowledge to the capacity to use that knowledge in speech and the ability to process language in real occasion (Gass & Selinker, 2008) making the distinction a bit tricky. For example, one can give a wrong impression by thinking of correct utterances of two or three may imply that a particular structure of that language has been acquired.

2.3.1. Children's acquisition of phonology

Children are able to acquire a great deal of their language's phonological system rapidly and efficiently, without any explicit instruction (Peperkamp, 2003). They acquire a certain type of sound at approximately similar stages, but with completely different rates (Gardner, Pascoe, & Stackhouse, 2006). In their first utterances, children produce a combination of consonant and vowel, but when analyzed, sounds appearing in their first utterances seem to be very limited (Crystal, 1997). The limitation is either due to inability to produce all the language's sounds or lack of perception, which needs further phonological investigation.

It is generally believed that children produce (correctly or erroneously) what they have perceived even though it is not evident before six months (Guasti, 2002). The earliest vocal production (before the period indicated) involves vegetative sounds such as crying, grunting, laughing and all that in response to immediate sensations which are constrained by the anatomical structure of an infant‘s vocal tract and progresses (Eriksson, 2014). The first speech-like productions take the form of babbling, which is characterized by a limited range of sounds resembling consonant-vowel (CV) syllables (Tavakoli, 2012). Then gradually move from the babbling to their first words within the ages of 12–18 months (Trudeau, Macleod, Sutton, & Thordardottir, 2011).

Research and theory are presently aimed at explaining the mechanisms underlying the developmental change in children's perception of speech; the manner in which sounds are processed (Boersma & Levelt, 2003). The processing entails different kinds of abilities, including segmenting and later manipulating sounds as phonemes and words, discriminating distinct sounds, identifying, and categorizing them (Eriksson, 2014). There are also several points of view on the extent to which infants are accustomed to speech (Tavakoli, 2012). An articulatory learning theory, which was basically a behaviourist theory, for instance, suggests that an infant has no perceptual capacity at birth and that the phonological system is entirely acquired through exposure to input (Ingram, 1989). Accordingly, the theory predicts that the young infant will be very poor

at speech perception and that s/he will only be capable of perceiving the characteristics of the language s/he is learning (Ingram, 1989).

Conversely, an attunement theory, one of the three-nativist theories provided by Aslin and Pisoni, proposes that the infant is born with the capacity to perceive certain fundamental sounds, which enables it to identify some of those features in the target language (Ingram, 1989). The hypothesis further notes that other sounds of the ambient language will be developed because of experience with the language being acquired. That means all infants are endowed with the same initial capacity and that linguistic experience will play a role in subsequent development. Secondly, the universal theory claims that all human infants are born with the ability to perceive all the speech sounds found in all human languages (Chomsky, 1986; Chomsky, 1999; Chomsky, 2000). This theory argues that young child preserves those sounds occurring in the native language, and eventually loses the ability to perceive the others (Ingram, 1989; Chomsky, 1999). The third theory according to the discussion by Aslin and Pisoni is maturation theory, which claims the emergence of infant's perceptual ability as a biologically determined schedule unaffected by the experience. This theory predicts the manifestation of new perceptual abilities for all children at approximately the same times (Ingram, 1989).

The process has several stages which begin with sensation when the object is perceived; after that, the perceived information goes through special areas in the mind and the sensory perceptions are interpreted creating mental images; and then correlated with appropriate cognitive associations (Bogdashina, 2005). Bogdashina (2005) further stated that excess sensory information brings sensory burden for it cannot be simultaneously sorted and processed and thus creates fragmented perception, delayed perception, hyper- and/or hypo-sensitivity, and inconsistency of perception. Psycholinguists made a major discovery in perception known as categorical perception. Given categorical perception, a child perceives the sounds by categorizing not as continuous regardless of widespread variability (Lust, 2006). Again as Tavakoli (2012) stated not enough is known about the

precise relationship between perception and production in phonological development. Several studies have shown that perception begins much earlier than production.

One of these is the 'fis' phenomenon which argues earlier ability of perception. The 'fis' phenomenon has got its name from an experience reported in 1960 by J. Berko and R. Brown (Strömbergsson, 2014). In the event, a child referred to his inflatable plastic fish as 'fis', but rejected his actual pronunciation as 'fis' and accepted 'fish' when repeated by adults (Strömbergsson, 2014). This implies that even if the child fails to produce the phoneme, he could distinguish it as being different from the phoneme /s/, illustrating that children's skill of perception precedes skills of production. Nonetheless, phonological theories do not indicate how perception may come into play (Tavakoli, 2012).

The other pressing issue is whether acquisition begins from the language's building blocks or from the perception of the whole utterances. Studies indicate the use of two basic strategies by infants while acquiring their first language: gestalt and analytic. In gestalt strategy, children mimic unanalyzed chunks of the adult speech and they learn how to break these units into meaningful segments only at later phases of development (Bogdashina, 2005). The view claims that children perceive the whole of the utterances regardless of the micro linguistic units; because the child seems to be targeting the whole (Vihman, 2014). So, according to this strategy children tend to use unanalyzed sequences on the threshold of the acquisition process and abstract linguistic rules from chunks at later stages. In this mode, language is considered as having restricted generative use and is rather inflexible in the early stages. Analytical strategy, on the other hand, is breaking the gestalt into more discrete units. In line of this view Peperkamp (2003) stated that children begin bottom-up from the perception of the acoustic signal. That means to acquire a word, the child must gain knowledge of the micro linguistic units (phonemes) encompassed within words. In the process, the child must gain the ability of both to articulate sounds and to use the contrastive elements (phonemes) of that language (Nelson, 1981).

In an acquisition, the other dominant matter is “are there universals of language acquisition i.e. resemblances in the manner all the children acquire language in spite of the particular language to which they are exposed?” Acquisition researches suggest similarity in achieving linguistic milestones but revealed differences of acquisition patterns at different age ranges (Guasti, 2002; San, 2010). Jakobson (1968) predicts a universal order of development. Certain segmental inventories are more likely than others are, while others simply never occur. Cross-linguistic studies of language acquisition have also accorded on the acquisition category of some sounds (Dodd, Holm, Hua, & Crosbie, 2003). For instance, from a comparison made between isiXhosa and English speaking children aged 2-6 years, it is observed that the order of acquisition of consonant is similar, apart from the rapidity nature of isiXhosa children’s acquisition (Hua, 2002). They acquired all the consonants shared by the two languages at three years and misarticulated sounds found to be difficult in other languages too (Hua, 2002). Jakobson (1968), as a result, proposed that some common sounds to all languages like nasals and plosives are acquired earlier than other sounds, while sounds that are less common (e.g. isiXhosa’s click sounds) would be acquired later; in fact, the finding was refuted by other researches.

Yet, different methodological and analytical findings on different languages led to different conclusions pertaining to the age of children’s phoneme acquisition due to variations. Ingram (1989) suggested four main types of variation: inter- and intra-child variations, and inter- and intra-word variation. Intra-child variation is the inconsistency of productions within a given child’s sound system in due course while inter-child variability considers an individual difference in terms of age, sex, social status and other physiological as well as psychological factors. Likewise, intra-word variation is a case that occurs when a child produces a given sound differently in the same context while inter-word difference happens while producing a sound in different ways across words and contexts (Hua, 2002).

2.3.2. Acquisition of clusters and phonological deviations

Speech contains strings of phonemes, that are categorical entities identified by their linguistic functions (Strömbergsson, 2014). These strings of sounds have varied features that mostly challenge the children when they attempt the target adult utterances. In the course of acquisition, children accordingly move through systematic developmental stages creating errors while producing the strings of the sounds with slight individual differences (Hua, 2002). A cluster of consonants in a word is one of these strings children face as a challenge during early production. They do not typically start uttering consonant clusters accurately. Consequently, the acquisition of consonant clusters is comparatively long in duration, and the process of development is somewhat gradual (Jakobson, 1968).

Early attempts of a consonant cluster often cause reduction of member(s) or substitution(s) of another segment or create reversals of sequences. Where their grammar prohibits coalesces reduction is the main strategy employed in the acquisition of consonant clusters at an early age for simplification. It is one of the most extensively described and frequently occurring phonological deviations in the speeches of children. With the method, children prefer one of the consonants to the other in the cluster (San, 2010) using different techniques of preference.

The reduction is motivated by some very specific and intricate considerations that cannot be easily characterized as omission either by the position of the consonant or by preferential retention for certain manners or places of consonantal articulation (Ohala, 1997). Sometimes children are relatively consistent in their omissions of particular consonants from clusters of identical nature and the pattern of omitted consonants is systematic. Various studies present evidence that children master the production of unmarked sounds or structures before marked ones (Demuth, 1996). This is a reason why children prefer one sound to the other, or preserve, or omit a segment from a certain word structure. In the present Optimality Theory explanations, it is often pointed out that markedness initially dominates faithfulness (McCarthy J. J., 2002), which highly

influences acquisition pattern. Sometimes, the sonority distance between C_1 and C_2 can be believed to be an indicator of markedness, which reflects the acquisition patterns of consonant clusters, which must be explained in terms of Sonority Hypothesis (SH).

Sonority is the relative perceptual prominence of one sound class against another (Syrika, Nicolaidis, Edwards, & Beckman, 2011). This hypothesis of sonority mostly governs the reduction pattern which predicts maintenance of the least sonorous member of the cluster in the strategy of children's cluster reduction. It further explains the impact on cluster members' markedness arising from the sonority distance exhibited between them. For instance, clusters whose members are close in the sonority scale are considered more marked than clusters whose members are far apart. Therefore, the omission of the consonants can also be accounted for the sonority sequencing generalization. Sonority sequencing principle (SSP), thus, reveals that for immediately neighbouring consonants, the repetition of any manner feature in sequence will be disfavoured. That means, for example, initial clusters reduce to any consonant in the cluster creating a highest sonority ascend, while syllable-final clusters reduce to whichever consonant in the cluster creating a smallest sonority descent.

In other words, the hypothesis predicts sonority-based selection as an effect on the strategy of cluster acquisition by children wherein the least sonorous segment of the target cluster is preserved (Boersma & Levelt, 2003) at the final position. So, clusters with greater sonority distance are easier to acquire than those with less sonority distance. For example, children normally acquire consonant clusters consisting of stop + liquid clusters before fricative + liquid (McLeod, Doorn, & Reed, 2001). The distances between the clusters is the same and must follow a similar pattern of acquisition. Generally, within any given language, a minimal allowable distance is tolerable within the clusters (Brown T. , 2012).

Different kinds of literature proposed various sonority scales while sequencing sonority. They all seem to agree on the arrangement of vowels at the top of sonority, sonorant

consonants in the middle, and obstruents at the bottom. The basic difference seems to involve in the details of discrimination among the sound classes, where different scholars assigned different numerical standards to sounds. Clements put segments on five-point scales while others increase the scale to about 12-points. For instance, Brown (2012) used the following 12-point scale.

(12)

Sounds	Sonority Indexes	Features
[a, æ, ə]	10	low vowel
[e, o]	9	mid vowels
[i, u, j, w]	8	high vowels
[ɾ]	7	rhotic
[l]	6	liquid
[m, n, ŋ]	5	nasals
[s]	4	sibilant
[v, z, ð]	3	voiced fricatives
[f, θ]	2	voiceless fricatives
[tʃ, dʒ]	1.5	affricates[vi]
[b, d, g]	1	voiced stops
[p, t, k]	0.5	voiceless stops

Some comprehensive reviews and accounts of child phonology thus make sure that the nature of the reduction is generally predictable cross-linguistically (Ingram, 1989). That is, children of all languages tend to reduce the same types of clusters to the same type of consonant. For example, fricative and stop clusters usually reduce to the stop, not to the fricative (Ohala, 1997) due to its low sonority scale. Indeed, the suggestion some argue alternatively to the opposite saying, “in a stop-X or X-stop cluster the one preserved is not always the stop” (Kager, Pater, & Zonneveld, 2004) violating the sonority sequencing principle (SSP). Further, omissions are not governed by the position of the consonant in the cluster; children may omit either the first or the second consonant.

Before correct production of a cluster, the other stage that a children progress through is cluster substitution (replacing one of the segments with another). Sometimes typically developing children may also delete the entire clusters though it is occasional. A few

studies reported that children aged 1-3 years seldom delete consonant clusters (Smit, 1993) and may use an epenthesis strategy to omit the cluster. It occurs when two elements of a cluster are separated by inserting a vowel between the consonants. Metathesis is also the other strategy used in an acquisition where the children reverse the actual adult target sequences of the clusters (eg. /ask/ becomes [aks]). Otherwise, clusters of consonants can be realised as one segment with the combination of the members' features. For example, clusters of /s/ and /p/ can be realised as [f] merging the features of the two sounds. That is /p/ is a labial sound with a plosive manner and /s/ is an alveolar consonant with a fricative manner. Combining the manner and place, the sounds can be replaced by [f], which is labial fricative sound. The process is termed as coalescence, which mixes both cluster members and appears as the child begins to produce some consonant clusters.

These kinds of 'errors' are called phonological processes in the study of child language (Lust, 2006), or phonological deviations, which are typical and natural part of language development and are to be expected in every child. In the normal developmental process, such processes illustrate children's simplification strategies of standard adult productions for its complexity (Crystal, 1997). These errors normally affect all the articulatory features in the beginning and gradually decrease with an increment in the cognitive and physical development of children. Processes related to a place of articulation are velar fronting, coronal backing, labialization, de/palatalization, dentalization, and debuccalization.

Changes related to a manner of articulation include gliding, stopping, de/affrication, de/nasalization, and de/vocalization, while de/voicing, de/aspiration, and de/glotalization are errors associated to the third feature. Some of these errors produced by the children are universal to every language while others are specific to all children acquiring the same language. The reason is some sound patterns are more typical compared to others (McCarthy & Prince 1994). The other kind of error is distortion where a sound is altered

to a non-first language sound. The substitution of a non-first language sound is an error that does not usually resolve by itself.

2.3.3. Acquisition of syllable

Children's performance gives an idea about sensitivity to varied syllable types indicating the relative occurrence of the different syllable types in languages. In effect, although there are some lists they may have in common; languages of the world have varied syllable inventories. So the availability and simplicity of the inventories dictate the form of the syllable structure used by children (Levelt, Schiller, & Levelt, 1999). OT accounts also for a language's syllable typology in a classy manner. Firstly, all languages have syllables of the form CV but not necessarily other forms, which follow from certain typological generalizations.

Studies on early phonological acquisition have shown that children select from a small number of word shapes or syllable structures in their first words (O'Grady & Cho, 2011). Jakobson (1968) hypothesized a universal order of acquisition for different types of syllable structure indicating that the first syllable structure to develop is consonant-vowel (CV) or CV reduplicated and then followed by CVC. Nevertheless, inventories of syllable structure vary from language to language with a diverse combination of syllables in words of a language (Gangji, Pascoe, & Smouse, 2014). Many findings came up with a result corresponding to the universality claim of Jakobson. For example, children were seen cross-linguistically babbling and using reduplicated CV syllables from 7-12 months. By the age of two, it was found that CV, VC, and CVV and two-syllable words were anticipated. Acquiring a language with closed syllables at an early stage of development for a child is often difficult and result with the omission of some segments (Fikkert, 2000). That is why a child reduces various words with difficult syllables to this simplest pattern by making some modification to the shapes of the adult target words.

The variability of such production affecting word shapes is grounded in three main sources, i.e. psychological makeup, phonological setup, and constancy of linguistic rules (Ertmer & Goffman, 2011). Primarily, physical and cognitive development of children might have an impact on their production. Secondly, alternations occur due to the composition of words originating from phonological setup (types of sound and phonotactics) of a language. From the optimality theoretical view, children's language is normally less marked than the target adult language to be acquired (Levelt, Schiller, & Levelt, 2000). Words containing unmarked sounds such as nasals and plosives are produced more consistently than other words with marked sounds of a language (Jakobson, 1968) while words may contain complex syllable structures with unmarked segments or less common (marked) segments. Therefore, syllables containing unmarked sounds are easier than syllables with marked sounds. Furthermore, segments constituting the syllables or syllables themselves can be placed on a range of markedness based on relative sonority.

From the syllable shapes, CV is regarded as the most unmarked and sonorous syllable shape since it is made up of one nucleus and one onset. Therefore, it is easier for a child to produce CV than CCV or CVC. Considering the sonority index, no matter what the value of the onset consonant could be, it is still relatively lower in sonority than CCV or CVC that were highly marked for clusters on the onset and possessing coda, respectively. Again, complex words might have more complex syllables like CCVC syllable or CCVCC with the complex onset and/or complex coda that must be simplified to some simple syllable structures depending on certain principle. When languages use such a branching coda and/or onset possessing clusters of consonants, languages put them in sequences depending on their sonority. As a rule, any syllable constitutes a segment with a sonority peak (the nucleus) preceded and/or followed by segments with progressively decreasing sonority numerical values.

A standard OT approach to the sonority has also tried to specify a hierarchy of fixed constraint rankings governing the occurrence of particular segments in syllable peaks and borders. Thus, as we advance from the beginning to the peak, the sonority level increases, and as we carry on from the peak to the end, it decreases. As per this hypothesis, high-sonority sounds always occur closer to the peak of the syllable (or nucleus) than the lower sonority sounds whether from the left or the right (Barlow & Gierut, 1999). The susceptibility of certain initial and final consonants to deletion as well as which member of an onset or coda cluster survives in cluster reduction is chiefly determined by this sonority principle for the sounds. The majority of evidence of this sonority pattern hypothesis comes from studies of tauto-syllabic clusters, i.e., those that are part of a single syllable occupying either an onset or coda position. Few studies have considered acquisition patterns for hetero-syllabic clusters, where the cluster consonants divide across two syllables, C_1 being a coda of the first syllable and C_2 an onset of the subsequent syllable.

Regarding constancy of linguistic shapes, studies show early acquisition of the syllable shapes with the highest frequency in a language, and the syllable shapes that are lowest in frequency are acquired last (Demuth, 2011). For example, Spanish-speaking children tend to acquire initial weak syllables several months earlier than English acquiring children do. On the contrary, English-speaking children acquire coda consonants several months before Spanish-acquiring children (Demuth, 2001). For that reason, she explained that the earlier acquired structures in each language are much higher in frequency relative to other syllable shapes. Thus, children tend to produce higher-frequency syllable shapes and prosodic word shapes before they produce lower frequency structures (Demuth, 2001). This runs against the claims by Chomsky that states frequency effects cannot explain the course of language development.

2.3.4. Factors affecting acquisition

Language development reveals the interplay of factors in at least five areas: social, perceptual, cognitive processing, conceptual, and linguistic. The traits are based on human experience and capability. Theorists vary in the emphasis and degree of determination posited for a given domain, but most would agree that everyone is significant. Socially, children gain knowledge of taking a more active role in social situations through better interaction (Bruner, 1983).

Children must have the opportunity to interact with other people in society (Gardner, Pascoe, & Stackhouse, 2006). The interpersonal dimension of interaction helps them to gain various language inputs from different members of the society. They get the inputs from multiple sources or from dyads with adults like father, mother, and others or with siblings ((Malmeer & Assadi, 2013). These members repeat children's utterances with corrections following their grammatical errors in a special approach. For example, mothers tend to talk in quite shorter, slower, clearer, and simpler utterances with high pitch and exaggerated intonation patterns and rising tones, whereas siblings speech, include a "higher proportion of attentional utterances and repetitions than that of the mothers" (Malmeer & Assadi, 2013).

For this matter, neglected or deprived children of social interaction may be delayed in cognitive development and language acquisition. Case studies on feral children (for example like a case study on a girl named Genie who acquired English after puberty) have shown severe deficits in phonology, morphology, and syntax resulting from the deprivation (Fromkin, Krashen, Curtiss, Rigler, & Rigler, 1974). Since Genie started learning the language after her pubescent, for instance, her development was slower than that of children. That means the age of exposure is an essential predictor of language acquisition. Shreds of evidence arising from such findings suggest that there is a critical or sensitive period for humans to acquire a language, which ends around puberty

(Hurford, 1991). That means the first years of life are more efficient for language acquisition to fully develop, in the existence of interaction with caregivers in society.

Child's position in the family may also play an important role in the development of language. In the past, it was thought that a child with older brothers or sisters had an advantage over the singleton with regard to language learning. Older brothers and sisters were considered better tutors than adults since they were closer to in age and in likeness. As they become nearer in age and likeness, imitation becomes easier for the children. Again, inputs frequently presented will be acquired first; the structure of a language to be acquired first must be presented more frequently than the other structures. Then the children ought to have adequate exposure to these structures to learn them properly. The quality and quantity of language input children receive during their interaction from society is significant (Rowe, 2012). When children do not have a significant amount of input, firstly they will simply obtain part of the relevant language structures or will experience a delay in acquiring the structures.

"Many naturalistic studies of children's speech have found that the more frequently children hear a particular morpheme, word, or construction, all things being equal, the earlier they acquire it" (Robinson & Ellis, 2008). Besides, consistency of pronunciation and rules can have an impact on acquisition since it takes time to recognize the irregular rules of language for a child. Beller (2008) suggested that there are great divergences among cultures and the parental styles of education regarding the quantity and quality of the language input where the traits have a crucial influence on children's language development. Sometimes, the complex nature of language elements has an effect on language development (Fikkert, 2000). During the production of sounds, children prefer the simple to the more complex function of language elements and gradually proceed to the apex of their language development (Jakobson, 1968; Demuth, 1996). In contrast, children making no interaction early on in life in society have difficulties acquiring language afterwards.

With reference to the sex of a child, some researchers agreed on the existence of differences in phonological development. Biological differentiation in the rate of maturation of the brain and in the language input they receive was presented for this argument; but other researches do not accept the issue (Hua, 2002). Generally, girls are considered better than boys in achieving verbal and linguistic functions (Dodd, Holm, Hua, & Crosbie, 2003). Hyde and Linn (1988) cited in Dodd *et al.* (2003) found insignificant variance (about 1%) after conducting a meta-analysis of more than 170 studies in language acquisition, but females were observed to perform better than males in the area of speech production.

Socio-economic status of a child's parents is another issue to be considered as a factor affecting acquisition. In essence, it is a macro-variable composed of several parameters like education, occupation, and income, which needs further exploration as it may account for controversial findings on the role (Dodd, Holm, Hua, & Crosbie, 2003). In most cases, this variable was dealt with in several former acquisition pieces of research and it was considered unlikely in language acquisition to be responsible for more than trivial deviations. Dodd, Holm, Hua, & Crosbie (2003) studied English speaking children to check the effects of this and other variables on language development and concluded by stating "no significant effects of socioeconomic status on any of the phonological accuracy measures."

Besides, a number of studies on bilingual children support the idea that exposure to two or more languages might have an impact on children's language and speech development. Research on children acquiring two languages at the same time from birth suggests that they would follow separate paths of development from monolingual children (Kovács & Mehler, 2009). So, Kovács and Mehler (2009) found that bilingual infants were better at learning multiple speech structures as compared to the

monolingual infants ensuing a suggestion that bilingual children are more flexible learners of a language.

2.4. Theoretical background

The field of phonological acquisition has changed and developed over the last decades jointly with various developments in phonological theories (Demuth, 2011). Acquisition theories and the theory employed in the study of child phonological acquisition are outlined in this section. Specifically, Optimality Theory (OT) was overviewed as it is designed for the purpose of data analysis in this study.

2.4.1. Theories of language acquisition

Wide varieties of theoretical approaches and research paradigms have been provoked to answer a question of how language acquisition occurs. Some of these theories are the behaviourist theory, the Nativist theory, the Rationalist theory (Cognitive theory), and the Interactionist theory. Of these, behaviourist, Nativist, and Interactionist theories were discussed mainly for their applicability to the acquisition of first languages.

The behaviourist theory is one of the theories that believe language as a behaviour learned from the environment by conditioning (Montrul, 2004; Bot, Lowie, & Verspoor, 2005; Brown, 2007; Gass & Selinker, 2008). That means children acquire a language simply because of an interaction with society through different reinforcement to reproduce and correlate in the same way like learning any other complex cognitive skill (Montrul, 2004; Gass & Selinker, 2008). Adherents of this theory view children as a blank slate to be filled with the knowledge of a language gained through experience from the environment (Brown, 2007). Brown (2007) states that children are born without any linguistic knowledge, but shaped and slowly conditioned through various schedules of reinforcements by their environment to acquire a language.

The behaviour gained, the language in this case, can be maintained if the consequences are rewarded, otherwise declined and eventually turned off if punished or lacks

reinforcement (Bot, Lowie, & Verspoor, 2005). To this end, children need primarily to hear an utterance (words and phrases) that have to be motivated by praising their attempt to reproduce the utterance, which serves as reinforcement. In other words, children gain knowledge of a language by copying and responding to the utterances of adults they hear; and by having their responses strengthened with repetitions, corrections and other reactions provided by parents. So, behaviourists intend that the environment is an essential factor, which determines and shapes the language development of children (Demuth, 2011).

Opponents of this theory, on the contrary, argue that it is simply not possible for parents to reinforce or punish all of the possible utterances a child will apply. Their ability of the language skills progressively develops even though adults do not continually correct their errors. For example, children make errors, such as overgeneralization of rules, which cannot result from imitation, while adults generally use correct forms. Again, the language that children hear contains too few examples to learn the correct rules, fragmented and incorrect sentences, not marked as a deviant and finite set of sentences. Nonetheless, they create a very complex language system not just reflexive of the input and acquire rules that they have no direct evidence for. This is a counter-argument arising from the poverty of the stimulus which describes the child's linguistic input or available evidence as "so impoverished and degenerate that no general-domain independent learning algorithm could possibly learn a plausible grammar without assistance" (Clark, 2001). Learning cannot also account for the rapid rate at which children acquire a language.

The other theory is Noam Chomsky's innateness or nativist theory. The theory proposes that children are predisposed in nature to learn any human language (Prévost, 2009). Biologically, human brains have an "organ" termed by Chomsky as Language Acquisition Device (LAD) that contains Universal Grammar (UG), a set of rules or parameters specifying all possible human languages (Chomsky, 1986; White, 2003). The LAD operates to abstract out the linguistic parameters, which underlie the particular

language used in the child's environment (Lebeaux, 2000). The view does not accept the idea of gaining a language from experience because children do not receive an adequate amount of information to learn the complicated rules of grammar (Chomsky, 1999). Rather, they are able to acquire the entire language rules, due to the instinctive capacity of the parameters in their mind. Chomsky's evidence for this argument comes from different accounts. One is even if different children experience very different environments the stages of language development happen at about the same ages in most children. Besides, children's language development follows a similar pattern across cultures quickly and effortlessly. Yet, this is a contentious view, as many linguists and psychologists do not believe the intrinsic nature of language on some reasons. Initially, linguists have failed to specify the nature of universal grammar and have speculated that this may not be possible (Lust, 2006). In addition, grammar is not learned as rapidly as one might expect if a great deal of innate knowledge is assumed. There is also little neurological evidence to support the existence of a biologically based LAD (the organ).

Another theory of acquisition is Vygotsky's social interaction theory, which incorporates the arguments of both nativist, and behaviourist theories. Interactionists suggest the indispensability of both the environment and the language input received from caregivers. They strongly assert the biological predisposition argument of the nativists, but, contrary to them, Interactionists emphasize the importance of both the social support that parents provide the child and the social contexts in which the child is instructed. They believe that to develop effective language skills parents must provide their children with a Language Acquisition Support System (LASS) (Bruner, 1983). The LASS contains various strategies and techniques adults, especially parents use to support children in their language acquisition process. One of these is child directed-speech (CDS) or 'motherese'. When using child-directed speech, parents speak to their children more slowly, in a higher pitch, and stress important words. In fact, children show a clear preference for child-directed speech.

2.4.2. Optimality theory

A number of different theoretical frameworks have been employed in a different period for the studies of phonology. In the eighties and early nineties, non-linear phonology and prosodic morphology were the dominant phonological theories that mostly considered representations and hypothesized that rules would follow from the representations (Fikkert, 2000). Chomsky's generative grammar transformed earlier viewpoint aiming to make clear how a grammar gets from the mental representation to the surface representation (Barlow & Gierut, 1999), which has normally explained the correlation in terms of derivation. However, Optimality Theory (OT), a framework in theoretical linguistics that was initially developed to give details of adult phonological phenomenon (McCarthy J. J., 2007) supposes a special outlook referring to as input and output representations (Gierut & Morrisette, 2005).

2.4.2.1. Basics

Prince and Smolensky (1993) originally proposed OT and other researchers developed it to give details of adult language phonology (McCarthy J. J., 2007). It turned markedness statements into the actual substance of grammars (Kager, 2004) which presently dominates phonological researches including phonological acquisition (Fikkert, 2000, McCarthy J. J., 2007). OT differs from the Chomsky's UG in that OT believes the violability of universal constraints (Kager, 2004). Its basic claims are that a grammar contains a set of ranked, universal constraints governing the well-formedness of utterances. OT formally considers that processes are neither triggered nor blocked and thus there is no real interaction between the two since processes and constraints are in separate grammatical components (McCarthy J. J., 2007).

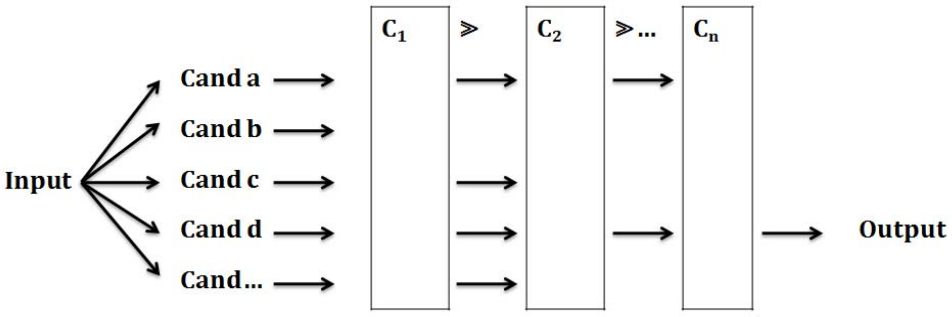
2.4.2.2. Architecture of OT

OT comprises three basic mechanisms, namely the Generator (GEN), Constraints (CON), and Evaluator (EVAL) with different functions (Barlow &Gierut, 1999; Gierut & Morrisette, 2005). Universal grammar provides GEN that "projects an unlimited set of

possible output candidates from a single lexical input form" (Hinskens, Hout, &Wetzeis, 1997). Given an input representation, GEN, as a result, generates all the potential outputs where the most optimal output is determined by EVAL considering a set of universal CON, which limits these countless of possible outputs (McCarthy J. J., 2007). All speakers possess the same set of constraints that are innate, but the ranking of the constraints is language-specific. Besides, constraints are violable, but the violations are only permitted when there is a conflict between a higher-ranked and a lower-ranked constraint. In this case, violations of the lower-ranked constraint are tolerated in order to satisfy the demands of the higher-ranked constraint.

EVAL receives the set of candidates from GEN and evaluates them by considering the set of constraints and chooses the most optimal output (Prince & Smolensky, 2004). All constraints can be violable, but the violation of high-ranked constraints is more serious than the violation of low-ranked constraints. The candidate, which has the fewest violations against the high-ranked constraints, will be chosen as the optimal output. The most optimal output is the candidate, which best satisfies the set of constraints. That means the output candidate is not the outcome of a process performed on the input. It is rather "part of the set projected by GEN and selected by parallel evaluation of all possible candidates" (Hinskens, Hout, & Wetzeis, 1997). The comparative mapping of input to output in OT grammar can be illustrated schematically as:

(13)



(Kager, 2004)

The candidates are compared by applying a hierarchy of violable constraints that evaluate the form of a candidate and its relationship to the input. Therefore, CON is universal, ranked, violable, and in conflict that contains two basic forms known as "markedness" and "faithfulness" (McCarthy J. J., 2007; Boersma & Levelt, 2003). Markedness constraints penalize marked outputs and favour outputs that are structurally unmarked (Dinnsen, McGarrity, O'Connor, & Swanson, 2000). Prince & Smolensky (2004) propose constraints like NoCODA, HAVEONSET, and *COMPLEX which state that syllables must not have codas, must have onsets, and must not associate more than one C or V to any syllable position node, respectively.

These constraints are reflective of linguistic universals, which suggest that preferred (or well-formed) syllables are of the shape CV. Markedness constraints specify universally observed limitations on the segmental position such as no coda on syllables (the universal preference for open syllables) and on features, such as no nasal vowels (the universal preference for oral vowels more than nasal vowels) or sonorant are voiced (the universal preference for voicing). In contrast, faithfulness constraints demand an identical match of outputs to their corresponding inputs (McCarthy J. J., 2007). Consequently, the constraint penalizes any difference between the input and output representations. This effectively prohibits deletion or insertion of a segment (sound). In optimality theory, it is argued that all markedness constraints outrank all faithfulness constraints yielding universally unmarked outputs only (Peperkamp, 2003).

These constraints can be ranked by the grammar of a language in order of importance, where the ranking evaluation could be formulated by means of a tableau. Input, output candidate, asterisk, and constraints are the crucial elements of the tableau, whereas exclamation marks, shading, and a pointing finger are extra bits, which make it easier on the reader (but add no new information). On the tableau, the top row will be filled in with the input and the set of ranked constraints. The high-ranked constraints are placed from the left and the ranking gradually descend to the right. The column on the far left is placed next to a set of possible output candidates, into which one of them is chosen and

entered as the optimal output. The other columns illustrate the constraint violations. Each violation is demonstrated by a violation mark (an asterisk (*)). The fatal violation which is enough to prevent the candidate to be optimal is indicated by an exclamation mark '!'. A pointing finger marks the optimal output or the most harmonic candidate that best satisfies the constraint ranking in comparison to all other potential candidates (Barlow &Gierut, 1999). Let us see these concepts with a hypothetical illustration.

(14)

Candidates	Constraint (C1)	Constraint (C2)	Constraint (C3)
1. ☞ CandA			*
2. Cand B		*	*
3. Cand C		*!	
4. CandD	*!		

On the tableau, C1, C2, and C3 are constraints that conflict in their evaluation of the three candidates. From the three constraints, C1 prefers Cand A, B and Cand C whereas C2 prefers CandA and D. C3, on the other hand, prefers Cand C and D. From these candidates, the conflict is resolved by ranking the three constraints where one of the constraints dominates the other. Consequently, C2 dominates C3 while C1 dominates C2 and C3 (written as [C1 >> C2>> C3]). A fatal violation occurs when C violates the second constraint and Cand D violates the first constraint (C1). Such violation blocks these candidates from being realized even though the candidates have a smaller number of violations. Note that cells to the right of fatal violations are irrelevant for evaluation and are therefore shaded. This leaves us with only two candidates (A and B) which will be evaluated with respect to the other constraints. Compared to CandA, CandB violates two of the constraints (C2 and C3) which block it from being realized. As a result, the optimal output is Cand A, which does not violate C1 and C2.

The issue to be addressed here is “How do I know which candidates and constraints to include in my tableau?” Here is a procedure that usually works practically. Firstly, it is advisable to start with the winning and the fully faithful candidate. Then in case, the winning is not identical with fully faithful candidate, it is better to add the markedness constraint(s) that rule out the faithful candidate. Again add the faithfulness constraints that the winning candidate violates, and create other ways to satisfy the markedness constraints that rule out the fully faithful candidate. Additionally, add those candidates and the constraints that rule them out. You have to use your judgment in deciding how far to take this step. If the winning candidate is matching the fully faithful candidate, then probably you are including this only to illustrate how faithfulness prevents the satisfaction of a markedness constraint that, in other cases, causes deviation from the underlying form. Hence, we have to add the markedness constraint, one or more candidates that satisfy that markedness constraint, and the faithfulness constraints to rule out those candidates.

2.4.2.3. OT in phonological acquisition

Recently OT is playing a vital role in phonological acquisition studies, as it is different in nature from rule-based theories like non-linear phonology (Fikkert, 2007). Rule-based theories suggest that the output is constructed by a gradual application of rules; but OT proposes a selection of an output from a variety of options using output constraints and constraints on input-output relations (Fikkert, 2007). One important viewpoint for using an OT account in the analysis of child phonology is its significance in the relational approach, where a comparison is made between the adult and child pronunciation. In this case, OT draws attention not just to differences, but also to similarities (between the child and adult realizations). As a result, OT gives the child credit for the partial mastery of the adult system, drawing attention to points of strength that can be used to build up to more adult-like realizations. Besides, OT as well combines the approach with the independent approach and lets us observe the child’s productions of words as reflecting the child’s independent phonological system (Stemberger & Bernhardt, 1997).

All languages have constraints that limit an adult's performance (McCarthy J. J., 2008). Many generalizations can be made about realizations of words by any speaker of any language (whether an adult or the youngest child). In OT, the child has some constraints that are not important for adult speakers of the language; but other constraints may hold true for both children and adults. Even though output forms of children are mainly different from that of an adult output forms, their input forms are assumed identical. In other words, inputs and constraints are the same for both adults and children (McCarthy J. J., 2008). For this reason, output dissimilarity must be due to variations in the ranking of the constraints (Fikkert, 2000). At the beginning of acquisition Markedness constraints outrank Faithfulness constraints.

Therefore, phonological grammars of children at first usually deliver more 'unmarked' outputs than adult grammars (Lacy, 2007). This further explains the mismatch between child and adult forms though a child's system must eventually change to approximate the adult target ensuing a re-ranking of constraints, with the demotion of the higher-ranked under certain faithfulness constraints (Barlow & Gierut, 1999). Language development, as a result, is a re-ranking of constraints for a child, which will be stopped when the outputs of the developing grammar and the target adult grammar are identical (Boersma & Levelt, 2003). However, the constraint ranking of a child's grammar may or may not correspond exactly to the ranking of the adult, but the result is largely the same output.

At the beginning of acquisition, markedness constraints outrank faithfulness constraints (Smolensky & Prince, 1993) and to explain the discrepancy between the input and output form of the child faithfulness constraints are generally ranked low (and are, thus, allowed to be violated). Equally, unviolated markedness constraints are ranked high preferably. As the child develops, the target forms (output) become more and more faithful to the input forms by re-ranking of the constraints. Faithfulness constraints are subsequently promoted, while the markedness constraints are demoted. Hence, OT is applicable in descriptions of children's common error patterns observed within and

between children, since the acquisition process involves the re-ranking of constraints. The simplification strategies of children while acquiring a certain language could also be best described using an OT perspective.

This approach considers the children's phonology as a dynamically developing system rather than as an incorrectly realized adult system (Barlow & Gierut, 1999). For this reason, this study employs the theory in the analysis of children's simplification strategies. In OT, the core syllable consists of an onset consonant followed by a vowel making up a CV syllable structure, which is assumed the most unmarked syllable type (Boersma & Levelt, 2003). Therefore, in OT deviation from this form results in a violation of one of the markedness constraints of syllables, which at first outrank faithfulness constraints. Here are some of the markedness constraints.

Onset: a syllable should have an onset.
NoCoda: a syllable should not have a coda.
***Complex-Onset**: a syllable should not have a complex onset.
***Complex-Coda**: a syllable should not have a complex coda.
MAX (seg): Every Input segment has an Output correspondent
(Boersma & Levelt, 2003)

The only optimal output is the CV syllable structure for children. Therefore, the adult forms with initial clusters or coda consonants cannot be tolerated. Accordingly, the reduction of clusters to singletons in child language, for instance, can be captured by a ranking of the markedness constraint *Complex-Onset or *Complex-Coda above the faithfulness constraint (Kager, 2004). Evidence for the unmarkedness of CV syllables emanates from a different basis. During the initial stages of language acquisition, studies revealed that CVs are the first syllable types produced by children. Similarly, unlike other syllable types, CV syllables exist in every language. Thus, children's cluster reductions is formalized as the result of the innate constraint *COMPLEX, which obliges children to conform to onset or coda clusters to singletons (Zamuner, 2003). A

common pattern for the ruling out of the segment in an onset cluster is the least sonorous member of the adult cluster to surface. Due to a fixed ranking of constraints relating sonority to onset position, several child phonologists have also analyzed the preference for low sonority onsets (Barlow & Gierut, 1999). OT further suggests that the innateness of constraints is not an essential property since constraints could emerge in the course of acquisition (Fikkert, 2007).

2.4.3. Summary

The question of how children acquire a language has generally intrigued researchers to two contrasting theoretical views with their own strength and limitations. One of the views considers language as a learned behaviour, while the other values an innate language capacity. Inadequacies of the explanations provided by the two views led to the theory of interactionists that recognizes the simultaneous significances of the two traits. As per the view, children acquire a language if they experience it in a social context, involved in social interactions and given a system of support even though they may have some innate ability. So, the theories do not agree on how children begin to learn the phonology of their languages and what units are considered the building blocks of phonological acquisition.

Additionally, they do not have the same outlook on the universality nature of speech development. These theories do not also explain the difficulties children develop with language acquisition "no matter how useful they might seem in explaining the development of language" (Bogdashina, 2005). Several theories based on those major theoretical views were formulated to account for issues related to language development. For instance, non-linear phonology, generative grammar, and optimality theory are some of the various theories probing the issue. The theories considered input as a data source for acquisition (Tavakoli, 2012) and believed existences of representations and hypothesized that rules would follow from the representations although they hold different views on the basic units of the representations. They have dealt with two major

issues; one is the universal tendencies in children's phonological acquisition, and the other is the role language-specific features play in influencing the phonological development in a given language. The theories further tried to discuss the relationship between perception and production and constraints on children's linguistic generalizations and abstractions (Tomasello, 2005).

CHAPTER THREE

3. METHODOLOGY

Studies on the acquisition of language phonology are concerned with developmental phenomena. These include children's initial and intermediate hypotheses about particular linguistic structures, the kinds of errors they make and the order in which different forms or structures are mastered. Two basic methods were used in the studies: naturalistic observation and experimentation paradigms. In the naturalistic approach, investigators observe and record children's spontaneous verbal behaviour. In experimental studies, researchers normally utilize specially designed tasks to elicit linguistic activity relevant to the phenomenon they desire to study.

Taking this into consideration, this study tried to describe the phonological development of monolingual Oromo speaking children integrating the experimentation paradigms and naturalistic observation. For all intents and purposes, an experimental paradigm was used for the elicitation of every targeted aspect, but the naturalistic observation was as well applied. In the following section, detailed clarification was given on participants, ways of data collection, stimuli used, and means of analyzing the collected data.

3.1. Participants and sampling

This work is a quantitative study consisting of 48 children of three age groups between 3,0-5,11 without considering the socioeconomic level since it was not pertinent to the context. The sample size indicated was essentially calculated to represent parts of a dialect's population chosen (N) at 95% confidence interval and (13.86%) margin of error and nil non response rate derived from (60%) of population prevalence (P) using the equation for calculating sample size determination formula shown in (15).

(15)

$$N = \frac{(z\,{}^{\alpha}/_{2})^2\, P(1-P)}{d^2}$$

Where

N is the total study population

$z\,\alpha/2$ is level of significance which is 1.96

P is prevalence which is population proportion 0.6

d is margins of error which is 0.1386 in this study

$$N = \frac{(z\,{}^{\alpha}/_{2})^2\, P(1-P)}{d^2}$$

$$N = \frac{(1.96)^2\, 0.6(1-0.6)}{(0.1386)^2}$$

$$N = 47.99$$

$$\underline{\mathbf{N \simeq 48}}$$

There were eight boys and eight girls in each group and the children were free from a genetic disorder, neurological problem, visual or hearing problems, or speech-language problems. Such details were collected using an interview regarding the child's overall development especially the linguistic ones, clinical history, current behaviour, and history of bilingualism. Besides, children with hearing and visual impairment or other health-condition creating barrier in communication were totally excluded.

In the study, additionally reachable participants were caregivers or parents. They help in providing essential information regarding age, speech disorders, and account of bilingualism. Secondly, they assist in data collection to friendly approach the children and let them freely speak and discuss the way they do during their activities.

3.2. Data collection procedures and tools

It is known that studies on language acquisition are always employing two approaches for data collection. The first approach is longitudinal where researchers "follow a single child, or a small group of chilldren in an intensive way taking relatively large samples at frequent intervals" (Crystal, 1997). The other approach researchers may employ is cross-sectional in which many children are selected to take smaller samples at less frequent intervals. For this research, the second method was considered as it is capable of providing confident generalizations about patterns of development with minimum individual differences (Hua, 2002).

Data was collected chiefly by means of experimentation paradigm using an elicitation method. For the method, the Diagnostic Evaluation of Articulation and Phonology (DEAP) (Dodd, Holm, Hua, & Crosbie, 2003) was used as a basis to develop the master single word list in Oromo with the help of my supervisor which consisted of ninety-four words tested before conducting the study. The test checks consonant and vowel sounds in different word positions and possible clusters in response to some pictures and imitation tasks. That means the assessment evaluated children's ability to produce individual phonemes, either in word-initial, word-medial, or word-final position in words of one to four syllables with various CV combinations and their utilization of phonological processes to simplify words using a choice of strategies.

Then they were asked to name the systematically selected objects and pictures. All the pictures depict objects and attributes, which are common to the children. When it is difficult to find enough appropriate items that can be pictured or are familiar to the children, imitation of a word that was controlled for various phonological properties were used. Additionally, the study used spontaneous speeches arising from activities or games and conversations with the children in joint play activities.

Furthermore, all the recordings were carried out at the children's homes by visiting them twice. A high fidelity microphone was used to record the speech samples onto a Marantz solid-state recorder (Model PMD 661 and Rode NTG-2 condenser) placing in front of the child while imitating and/or naming the pictures. Its position was as well made suitable to record all the speech samples at 44.1 kHz, low-pass filtered at 22.05 kHz and quantized at 16-bit.

In all cases isolation of the children was impossible and recording was conducted in a highly natural, everyday setting. In the course of recordings, parents/caregivers and the data collector must be present although the presence of other guests was not prohibited too. For that matter, interruption may occur on the children's responses by noises and interferences from the environment immediately before, after, or during the recordings. Therefore, to increase the chance of getting an audible utterance, the recording from each child was made twice. If a socioeconomic factor is applicable in the Ethiopian context, the children were residing in a rural area with low or middle-class parents during the time of data collection. The number of tokens for each target phoneme is identical across children, and all children produced every target phoneme at least on one occasion. Still, there were cases in which a certain target phoneme be produced with more frequencies than expected where spontaneous speeches were additionally considered.

Generally, two major techniques were used to get the utterances from the children; specifically the object/picture naming and imitation/repetition. These systematically selected words were designed to test for the occurrences of each sound in all word positions and their possible clusters in the language. Some picture books and toys were as well used to encourage the children to speak. Then they were asked to name the systematically selected objects and pictures while imitation was employed where the concept was found to be difficult to get its picture.

3.3. Transcription and reliability

In the present study, all the speech data collected were transcribed phonetically using IPA symbols to apply a broad phonetic transcription. For simplicity of repeated listening to segments and use of PRAAT Software in the transcription, the speech samples were copied onto a computer.

In this study, transcription reliability was considered only for consonants. To set up inter-rater reliability by the researcher and research assistants, a total of two speech samples (4.17%) of the data (the youngest and the oldest) were given to native speaker research assistants. In fact, the responses were not coded but transcribed using a binary ‘‘correct/incorrect’’ system to protect against transcribers’ biases that revealed some differences we resolved through consensus. The inter-rater point-to-point agreement for the entire phonemes ranged from 94.58% to 96.99% with a standard deviation of 1.70 for the younger age. For the oldest age group, it was ranged from 93.98% to 98.19% with a standard deviation of 2.98. The mean percentages of the consonant agreement for these transcriptions were 95.77% for the youngest group and 96.04% for the other. The transcribed samples were finally copied into worksheets using appropriate phonetic symbols for the data analysis. The Cronbach alpha coefficient of the data as well revealed a good internal consistency (= 0.8) for the study.

3.4. Analyses

To organize and summarize the data for evaluating its attributes, descriptive and statistical analyses were carried out. The descriptive analysis was made at two levels: the Independent Analysis and the Relational Analysis. Independent analysis examines the utterances of a child regardless of the relationship with the adult pronunciations. To do this type of analysis a profile was created for the responses of each participant. The responses were also sorted according to the type of segments (consonant or vowel), simplification patterns, and types of the phonological process employed as well as the structure of syllables. In the target words, frequencies of the sounds and syllable shapes

in different positions were also computed. Descriptively, types of sounds and phonological processes employed in children's speech were described with standard linguistic procedures. In addition, aspects like segment length, specifically vowel length and consonant gemination were as well treated.

On the other hand, a relational analysis was made using inferential statistics where comparison of articulation accuracy of a child was made against the adult target forms. In this case, two-way analysis of variance was employed to test out the effects of age and sex on the acquisition of the phonemes. Further analysis in relation to this is the calculation of Percentage Consonant Correct (PCC) and Percentage Vowel Correct (PVC) which were made using a formula:

(16)

To calculate PCC

$$PCC = \frac{\text{\# C's Correct}}{\text{\# C's targeted}} \times 100$$

To calculate PVC

$$PCC = \frac{\text{\# V's Correct}}{\text{\# V's targeted}} \times 100$$

For the purpose of these analyses, the included participants were categorized into three groups depending on their age range. By means of this categorization, three tags were established. These are participants with the age ranging from 3,0-3,11 as group 1, participants ageing 4,0-4,11 as Group 2, and 5,0-5,11 participants as Group 3 (see TABLE 3).

Group (G)	Age range	Sex		
		F	***M***	**T**
1	3;0-3;11	8	8	16
2	4;0-4;11	8	8	16
3	5;0-5;11	8	8	16
	Total	**24**	**24**	**48**

Table 4: Categorization of the participants

The entire sample consisted of 48 participants with a similar proportion for male and female. Based on this categorization, the groups were referred to in the results and discussion sections occasionally as Group 1, Group 2, and Group 3, respectively indicating the division of the children corresponding to their age range. From a theoretical point of view, an Optimality Theory was employed synchronizing with the sonority hypothesis to examine creative changes at different ages. That means, children's simplification strategies such as patterns of fronting/backing, assimilation, deletion, and cluster simplification were accounted for using Optimality Theory viewpoint.

3.5. Ethical considerations

Each ethically vital measure was carefully designed in carrying out this study. Firstly, formal letters from Addis Ababa University was addressed to district administrators and children's caregivers to provide them with the necessary facts elucidating objectives and purposes of the study. The letter described the importance of the study, what is needed from caregivers, the age range and the participants required for the study. To take audio-recordings, parents were asked for permission to conduct the study with their children.

For this concern, both children and caregivers were informed issues of autonomy, confidentiality, and consequences while participating in the study prior to data collection. Firstly, no child took part in the study without his/her parent's permission. In

other words, parents were notified that they have the full right to refuse the involvement of their child and possibly take them out of the study at any point without justification. Besides, the child is quite within his/her rights to ask for rejection from participating or could be excused just in case of his/her reluctance to participate in the study. For privacy, the participants were given reference numbers to exclude details such as name or any other identifying information in the audio recordings and the reports. It was also made clear as no mischief or harm would be inflicted on the willing participants for being part of the study.

CHAPTER FOUR

4. RESULTS

4.1. Introduction

This chapter describes the study findings by examining and presenting the collected data in line with the study objectives. The analysis examined the participants' speeches relating specifically to the acquisition of consonants and vowels, clusters, phonological processes, syllable structure, and segment length. Then results obtained from the data were explained using figures and tables with a summary.

4.2. Independent and relational analyses

Independent analysis measures the consonant and vowel inventories, syllable structures, and consonant clusters children produce, without considering the attempted target form. An analysis of this type was provided in this study to determine the set of consonantal and vowel types, phonotactics, and syllable shapes that occur in the production of children acquiring Oromo at each age group. For the investigation, data obtained from each member in the age group was phonetically transcribed using computer software named PRAAT with an IPA by means of phonetic symbols. On the other hand, making use of the method of analysis known as relational, the child's correct and incorrect productions of a word were compared with the standard adult form in terms of simplification strategies or error patterns or phonological processes (Dodd, Holm, Hua, & Crosbie, 2003).

4.2.1. Phoneme inventory and correctness

As previously stated, the target words elicited all consonants and vowels in different word positions to examine their acquisition of each sound that must be defined using certain criteria. Still, the criterion used in outlining age of acquisition was not either clearly established or differs from one study to another. For the most part, the criterion of 75% of children producing a sound correctly in different word positions was

commonly used in the past (Dodd, Holm, Hua, & Crosbie, 2003) while others use the criteria of 50% or 90%. In this study, consequently, a sound was counted as having been acquired (mastered) by an age group when (75%) of the children in the age group produced the sound in three-fourth of its occurrences throughout the speech sample in any word position. From the children's point of view, a sound is said to be acquired, when correctly uttered by at least twelve children within the age groups in any word position for this study.

In addition, children's utterances of the sounds were generally categorized into customary and mastery based on (75%) acquisition criteria. On the customary production, their production was counted either as distortion or not acquired. In this case, a sound was regarded as not acquired or distorted when recorded or realized mainly in the way expressed by a child under investigation in any word position within the target data. Likewise, a sound was considered as 'distorted' when its realization became indeterminate or simplified to the non-typical sound of the language within the target productions of their utterances while simplifying or replacing a sound with some other sounds in the language was measured as 'not-acquired'.

All phonological researches on Oromo indicated that there are three types of consonant sounds, i.e. plain consonants, ejectives, and an implosive. The plain consonants contain stops, affricates, fricatives, glides, nasals, flap/trill, and lateral sounds. Similarly, vowels are of two kinds: the short and the long vowels. Prior to heading for the detailed analysis of the acquisition patterns of these phonemes, it is better to enlighten the inconsistencies of the sounds' frequency in the data, and in the language. Though it is still considered unknown for Oromo and its dialects, the occurrence frequency is well documented for many of the major world's languages like English.

Studies show that the frequency of consonant's occurrence in a language is supposed to have a considerable impact on the child development of the sounds (Demuth, 2011).

Therefore, the frequency of the sounds employed in this sample was computed and presented, even though it is difficult to use this sample as a proxy to identify the frequency of consonant sounds' occurrences that are used in Oromo speaking adults (for the words were purposefully targeted), unlike the purely spontaneous speech sample. Yet, it may throw light on some points to be considered on the computation of frequency of the sounds' occurrences used in the language. FIGURE 2 shows the occurrence frequencies of the consonant sounds in the target words of the data.

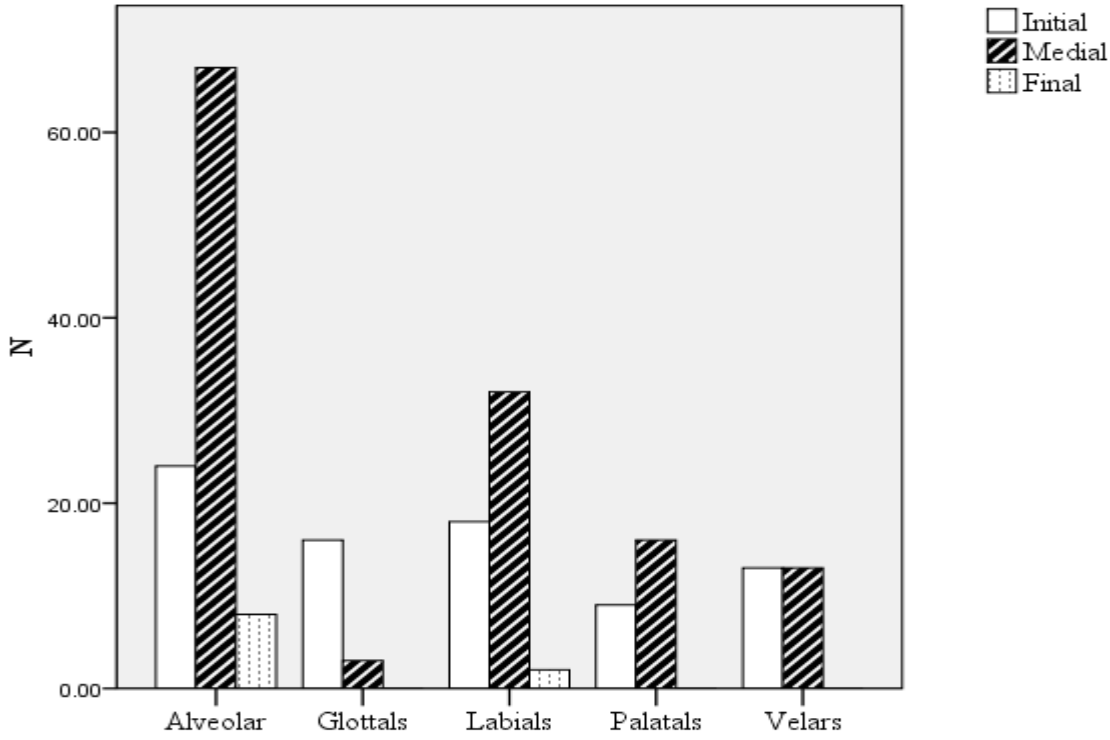


FIGURE 2: The frequency of the language's consonants in the data

Three important points can be deduced from this FIGURE. Firstly, since alveolars have the leading list of consonants (8 of 24) in the language, the size of alveolars included in the target words clearly surpassed the other sounds. Secondly, labials and alveolars were the only sounds occurring in the final position of a word. Finally, it can be seen that glottals have undeniable prevalence more than palatals and velars. The occurrence of the target consonants was further calculated while taking consonants used by Oromo into

account. FIGURES 3-6, as a result, point up the occurrence of a particular sound in the target data within the sounds' category.

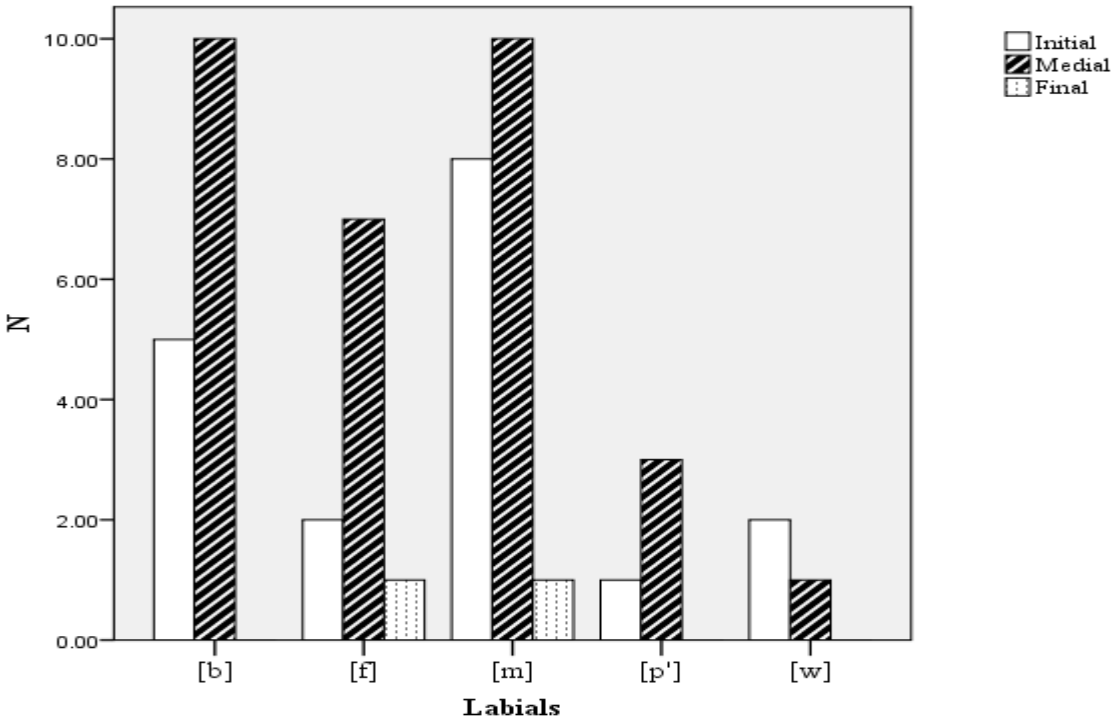


FIGURE 3: The frequency and distribution of labials in the data

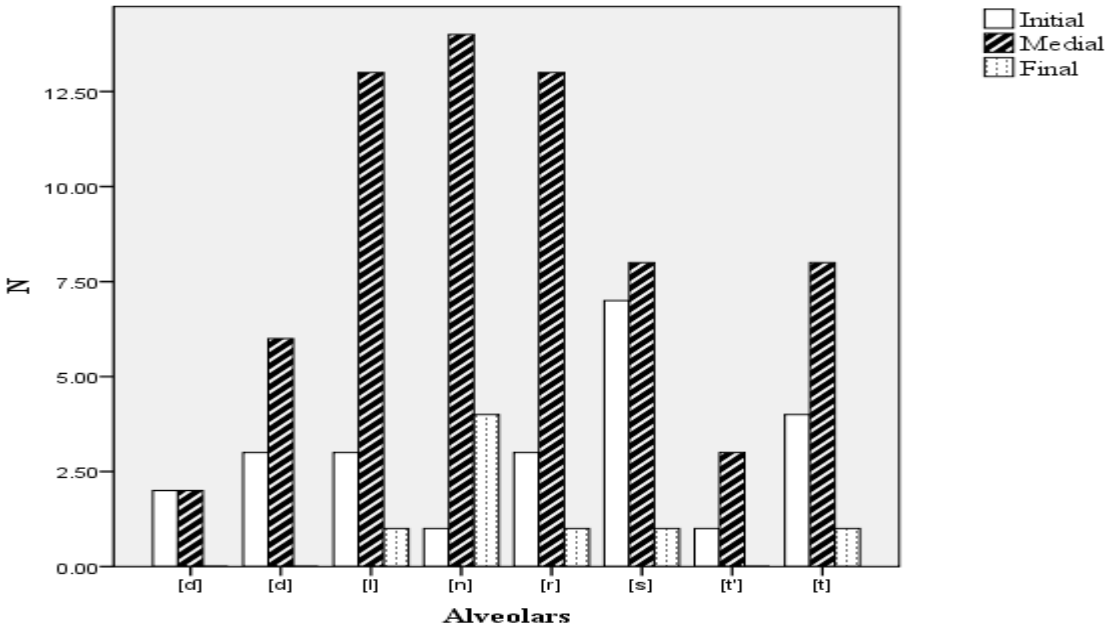


FIGURE 4: The frequency and distribution of alveolars in the data

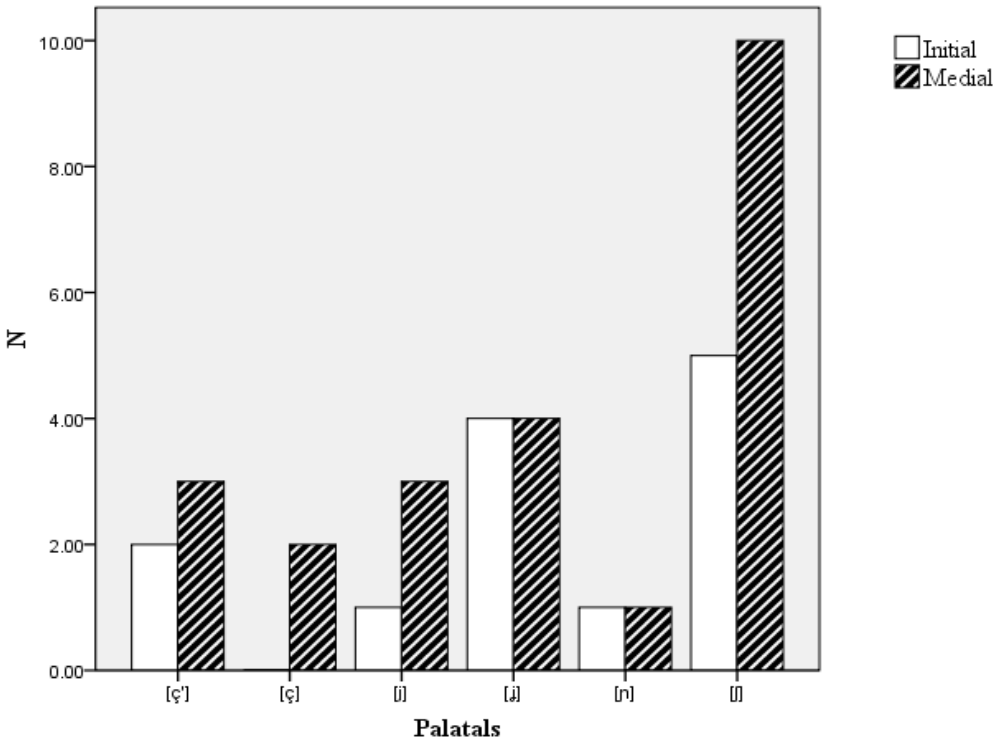


FIGURE 5: The frequency and distribution of palatals in the target data

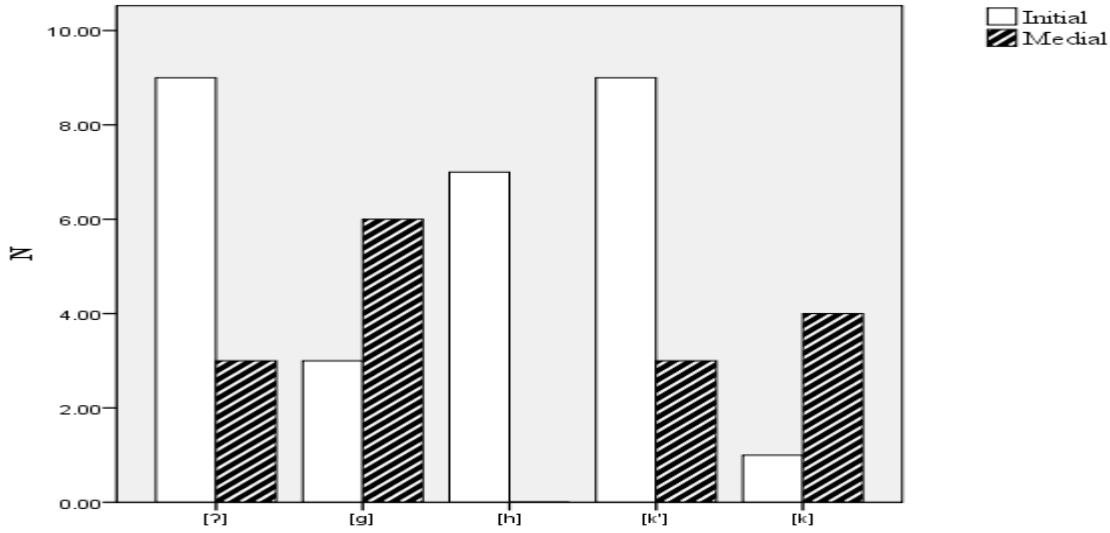


FIGURE 6: The frequency and distribution of velars and glottals

Note that recordings from the spontaneous speech were not included in the counting although treated in the analysis. From the alveolar sounds, /ç/ is the only sound not tested word initially and was not recorded in their spontaneous speech too. Seven consonants, namely (/f,l,m,n,t,r,s/), were the only sounds targeted to verify their accuracy of production in word final position as they are the only ones occurring word finally in the language. Of these seven consonants [n] was the sole sound seen to occur more than the expected target; the sound occurred four times in this position while the remaining sounds occurred simply once. There are no palatal, velar, and glottal sounds happening word finally in the data as they do not occur in the language.

To begin the analysis with the phonemes' correctness in relation to the adult target, a metric called PCC and PVC were calculated to evaluate the level of children's phonological performance and the status of the children's speech. The result assists to quantify the severity of articulation performance as an index. In addition, the calculation helps to inspect a pattern of sequential development and increased accuracy with age, as has been established in other studies. Basically, dialectal variations were accepted as inaccurate in the accuracy measure since correctness was considered simply taking into account the exact target sound realization. Thus, TABLE 4 revealed the PCC calculation across the age groups.

Feature	Sound	Correct Production					
		3 yrs	%	4 yrs	%	5 yrs	%
Labials	/b/	114	47.50	198	82.5	211	87.92
	/m/	263	86.51	270	88.82	288	94.74
	/f/	140	87.50	140	87.50	144	90
	/w/	46	95.83	48	100	48	100
	/p'/	53	82.81	60	93.75	64	100
Alveolars	/t/	197	94.71	204	98.08	206	99.04
	/d/	103	71.52	114	79.17	128	88.89
	/n/	180	59.21	210	69.08	272	89.47
	/t'/	48	75	59	92.19	62	96.88
	/l/	259	95.22	265	97.43	270	99.26
	/r/	198	72.79	210	77.21	239	87.87
	/s/	122	47.66	150	58.59	194	75.78
	/ɗ/	60	93.75	62	96.88	63	98.44
Palatals	/ʃ/	220	91.67	228	95	235	97.92
	/j/	60	93.75	62	96.88	61	95.31
	/ɟ/	80	62.50	95	74.22	109	85.16
	/ɲ/	24	75	27	84.38	31	96.88
	/ç/	24	75	29	90.63	28	87.25
	/ç'/	59	73.75	64	80.00	73	91.25
Velars	/k/	71	88.75	76	95	75	93.75
	/g/	108	75	120	83.33	127	88.19
	/k'/	119	61.98	146	76.04	159	82.81
Glottal	/h/	84	75	90	80.36	85	75.89
	/ʔ/	168	87.50	172	89.58	167	86.98
Mean		116.67	77.91	129.13	86.11	139.13	91.24
SD		71.55	14.45	75.18	10.43	82.98	7.02

Table 5: Summary of correct production across age groups

Irrespective of the sounds classes, the PCC was generally increased progressively over the age groups but indicated variation across sounds and age ranges. That means, children may make the lowest or the highest percentage of correctness with different sounds of the language at different age range. Within groups under investigation, the calculated PCC of the children ranged from (77.91%) to (91.24%). Additionally, correctness showed discrepancy across various sounds and sound classes. From the sound classes, velars and glottals showed the smallest and the largest correctness proportion, respectively within the age groups. Then again the bilabial stop and the alveolar fricative were the two sounds that showed the least percentage while the alveolar voiceless stop showed the highest within the three age groups. The following tables show the mean average and standard deviation on the basis of correctness variation across groups depending on the sounds' feature categorization.

Place		**Correct Production**					
Feature		**3 yrs**	**%**	**4 yrs**	**%**	**5 yrs**	**%**
Labial	N	616	75.49	716	87.75	755	92.52
	Mean	123.20	75.13	143.20	90.13	151.00	94.27
	SD	87.75	18.80	93.64	6.65	100.74	5.57
Alveolar	N	1167	76.23	1274	83.58	1434	91.95
	Mean	154.11	72.30	166.89	81.01	185.44	91.27
	SD	73.77	17.53	74.33	14.87	82.15	8.14
Palatal	N	467	78.61	505	86.85	537	92.30
	Mean	53.00	77.12	58.83	86.07	62.87	92.04
	SD	23.75	11.91	26.62	8.88	30.37	5.28
Velar	N	298	75.24	342	84.79	361	88.25
	Mean	113.50	73.65	133.00	84.09	143.00	88.02
	SD	7.78	13.39	18.39	9.56	22.63	5.47
Glottal	N	252	81.25	262	84.97	252	81.44
	Mean	126.00	80.77	131.00	84.72	126.00	81.06
	SD	59.40	8.84	57.98	6.52	57.98	7.84

Table 6: PCC result based on place feature

TABLE 6 compares the calculated PCC of each group depending on the sounds' place feature. The results of the PCC indicated significant differences between the children within the three age groups and varied across ages approving developmental sequence across the age categories. In all cases, the performance of the older group was more accurate than the younger group on the speech sounds' accuracy measures.

The mean average increased across the groups [(75.13%) to (94.27%)] while the standard deviation decreased in percentage. This indicates that the participants' utterances resemble the adult target realization while their age increases. The impact of the variation with stops seems to emerge from the incorrectness of the bilabial stop. Of these sounds, alveolars showed the least mean percentage less than (75%) signifying a lot of errors. On the contrary, palatals and glottals resulted greater than (75%) for the first age group. Secondly, the mean percentage of the palatals is larger than the velars for the first and the second groups revealing higher palatals' accuracy than the velars. For the glottal sounds their accuracy is normally greater than (80%) that indicates mastery of the sounds before the age of three.

In spite of that, the standard deviation of the second group is less than the other groups in the accuracy calculation of the glottals even though the mean percentage consistently increased over the three groups. The mean percentage indicates that velars have the least accuracy across the groups (71.6%) while glottals have the highest percentage. The ejective velar has taken out its glottal feature repeatedly in their speech that must have created an impact on the result. For all the children, the order of consonant accuracy corresponding to sound classes from low to high was observed to be velars, alveolars, labials, palatals, and glottals for the first group, but alveolars, velars, glottals, palatals, and labials for the second group and finally, glottals, velars, alveolars, labials and palatals for the third.

In addition to the place feature of the sounds, PCC was calculated for each child and was averaged per age group on the basis of the sounds' manner. TABLE 6 summarizes the mean percentage of the children's correct production of the sounds depending on manner.

Manner Feature		**Correct Production**					
		3 yrs	**%**	**4 yrs**	**%**	**5 yrs**	**%**
Stops[8]	N	821	79.82	946	89.22	977	91.89
	Mean	117.29	75.85	135.14	88.65	139.57	91.64
	SD	49.42	16.79	57.12	7.65	58.59	5.16
Fricatives	N	566	75.46	608	80.36	658	84.90
	Mean	141.50	70.61	152.00	77.72	164.50	83.86
	SD	57.30	19.84	57.06	15.70	64.76	10.95
Ejectives	N	279	73.39	329	85.50	358	92.74
	Mean	69.75	72.59	82.25	84.81	89.50	92.26
	SD	33.14	8.60	42.55	8.80	46.58	7.54
Nasals	N	467	73.57	507	80.76	591	93.70
	Mean	155.67	71.80	169.00	79.82	197.00	93.59
	SD	121.34	13.70	126.58	10.36	143.98	3.81
Liquids	N	457	84.01	475	87.32	509	93.57
	Mean	228.50	82.51	237.50	86.15	254.50	93.22
	SD	43.13	15.86	38.89	14.30	21.92	8.05
Affricates	N	104	68.75	124	82.43	137	86.21
	Mean	36.92	68.18	44.44	81.61	44.55	86.19
	SD	39.60	8.84	46.67	11.60	57.28	1.48
Glides	N	106	94.79	110	98.44	109	97.66
	Mean	53.00	94.78	55.00	98.42	54.50	97.60
	SD	9.90	1.47	9.90	2.21	9.19	3.32

Table 7: PCC result based on manner feature

[8] The implosive sound is categorized under stops.

Like the place feature of the sounds, the result indicated a gradual progression from group one to three. For all the sounds, the mean percentage increased as the age of the participants increased. The mean PCC score for Oromo speaking children consonants ranged from 68.18% (for group 1 Affricates) to (97.6%) (for group 3 Glides). Generally, accuracy measure of the sounds for affricates, fricatives, ejectives, and nasals is less than (75%) at the age of three, but greater than (85%) at age five for all these sounds except fricatives. An impact manifested on fricatives mainly relates to the acquisition of the alveolar fricative which is realized in different forms. The greatest and the least mean percentage on accuracy measure were obtained, respectively with glide and affricates at the age of three. In addition, the least standard deviation is obtained with glides at year three while the greatest is recorded with fricatives. Generally, correctness increased across age groups signifying the effect of age for the correct production of the consonants. This was not surprising as the inventory analysis of the older children showed a more complete set of phonemes than the younger children.

Generally, the standard deviation is very large and do not seem to have any pattern across age groups. However, higher standard deviation indicates variations, which is quite acceptable in children's sound development. On the other hand, similarity was manifested in PVC scores for all the children revealing completion of its acquisition before the age of three. The mean percentages for PVC for each age group have shown greater than 90% accuracy even at the age of three (see TABLE 7).

Vowel	3 yrs	%	4 yrs	%	5 yrs	%
/a/	1504	94.95	1568	98.99	1584	100
/e/	162	92.05	171	97.16	174	98.86
/i/	323	91.76	339	96.31	345	98.01
/o/	149	93.13	156	97.50	158	98.75
/u/	196	94.23	203	97.60	204	98.08
Mean	229.92	93.21	240.71	97.50	243.81	98.74
SD	583.87	1.37	608.39	0.97	614.35	0.80

Table 8: Percentage of correct vowels' production across age groups

This computation indicated near-perfect accuracy for the participants at the age of three. The standard deviation for the groups is somewhat small indicating that all these children are approaching the ceiling for all types of vowels. Of the vowels, the most frequently occurring sound (the low central vowel) is the most accurate vowel followed by back vowels. Below is the mean percentage of the sounds' PVC based on their distinguishing feature.

	3 yrs	%	4 yrs	%	5 yrs	%
Front	485	91.86	510	96.59	519	98.30
Central	1504	94.95	1568	98.99	1584	100
Back	345	93.75	359	97.55	362	98.37
Mean	533.30	93.50	557.20	97.70	563.85	98.88
SD	632.62	1.56	658.77	1.21	664.85	0.96

Table 9: Percentage of vowels' accuracy measure based on distinctive feature

With reference to the front vowels, back vowels have a superior mean percentage. As per the vowels' frequency in the data, the least frequent vowels (back vowels) have the highest percentage weighing against the other vowels. In combination both back and front vowels were not frequent (although front vowels surpass back vowels) and their mean percentage jointly resulted less than (99%) before the age of six (correspondingly

(92.63%), (96.99%), and (98.33%)); frequency of the sounds in the language must have an effect on their accuracy.

The accuracy calculation generally indicated developmental progression and the scores approaching the ceiling for all the age groups. Worth noting here is, the mean percentage showed the highest accuracy measure for PVC compared to PCC for all the participants. In the following section, we shall consider the details of the acquisition patterns manifested in the speech of Oromo speaking children for consonants beginning with labial sounds.

4.2.1.1. Acquisition of labial sounds

Labials are sounds articulated with the involvement of at least a lower lip (labia). In the target language, sounds considered as labials include the bilabial-voiced /b/, the bilabial ejective /p'/, the bilabial nasal /m/, the labiodental fricative /f/, and the bilabial glide /w/, with a diverse feature, frequency and distribution. From these labials, the stop was widely distorted in the children's utterances; children in the first and second group mainly produced its voiceless equivalent. In all the instances, word-initial [b] was fairly realized by the majority of the participants accurately in the second and third age groups, but most of the children from the first and some from the second group made the sound at least to lose its voicing quality. For example, a word /biʃa:n/ 'water' was realized often as [piʃa:], devoicing the sound. All the children (100% within age group) from the first group produced the sound as voiceless at least on one occasion changing it to a non-typical sound of the language, especially when it occurs as a second member in a cluster with liquid sounds as in the case of /ʄilba/ 'knee' and /torba/'seven' that were realized, respectively as [ʄilpa] and [t^{w}orpa].

Further, some children in the first group may show the tendency even in geminates (e.g. /ʄabbi:/ as [ʄappi:] or [ɖ̥appi:] 'Calf'). With the second and third groups, the number of participants produced the sound the way indicated was continually reduced; signifying

persistence of the imprecision at the age of four and five as well. Alternatively, the sound can be realized as fricatives like [β] and [f] in word medial position. These divergences seem to happen in all the three groups due to phonological processes/deviations arising from the child's development and/or the input of the dialect. The deviation, as a result, does not necessarily imply the inaccuracy of the children's productions owing to some expected phonological processes in the adult target. With the accuracy calculation, therefore, some of the processes of this kind can be considered as typical production for the sound in the position (attributable to its appearance in the adult speech).

(17)

Input	**Realized**	**Gloss**
/k'uba/	[k^{w}uβa]	'finger'
/wara:bessa/	[wara:βessa]	'hyena'

From the example, it can be understood that they made some phonetic realizations resembling the adult utterance targets with some phonological processes (see the section dealing with phonological processes). The other circumstance of the realization for the sound is the labial fricative [f] sound; where it basically takes the first member in a cluster as in [ʔafʃa:la] for /ʔabʃa:la/ 'astute'. Finally, the sound was not tested for its accuracy in the word-final position meant for its nonappearance on no account in the language. Generally, irrespective of the phonetic realizations expected in the adult target, acquisition of the phoneme for the individual participant was tested and summarized in line with its descriptive statistics in TABLE 10 and FIGURE 7.

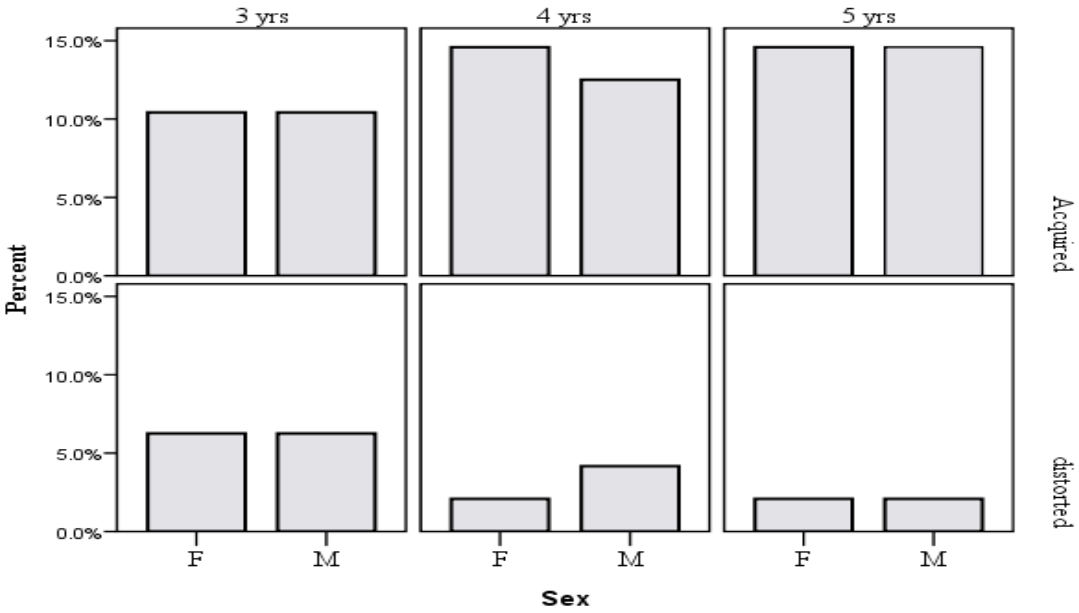


FIGURE 7: Labial stops realization

[b]				Sex		
				F	**M**	**T**
Acquired	**Age**	3	N	5	5	10
			%	62.5	62.5	62.5
		4	N	7	6	13
			%	87.5	75.0	81.3
		5	N	7	7	14
			%	87.5	87.5	87.5
	Total		N	19	18	37
			%	79.2	75.0	77.1
distorted	**Age**	3	N	3	3	6
			%	37.5	37.5	37.5
		4	N	1	2	3
			%	12.5	25.0	18.8
		5	N	1	1	2
			%	12.5	12.5	12.5
	Total		N	5	6	11
			%	20.8	25.0	22.9

Table 10: Realization of the bilabial stop across groups

On the basis of the subjects' categorization, an analysis of variance was conducted to explore the impact of sex and age on the acquisition of bilabial stop resulting in a significant main effect for the age group [F (2, 42) = 116.387, p = 0.000), p < 0.05 for all these measures, with large effect size (eta square = 0.702). This means that the articulation accuracy between children in group 1 as well as group 2 and 3 is significantly different, whereas the same is not significantly different between males and females [F (1, 42) = 1.114, p = 0.297) although its effect size is large (eta square 0.26). The interaction of age and sex has no significant effect [F (2, 42) = 0.289, p = 0.751) but has large effect size (eta square 0.14). Estimated marginal means do not comply with the effect size revealing a possible interaction as can be seen from FIGURE 8.

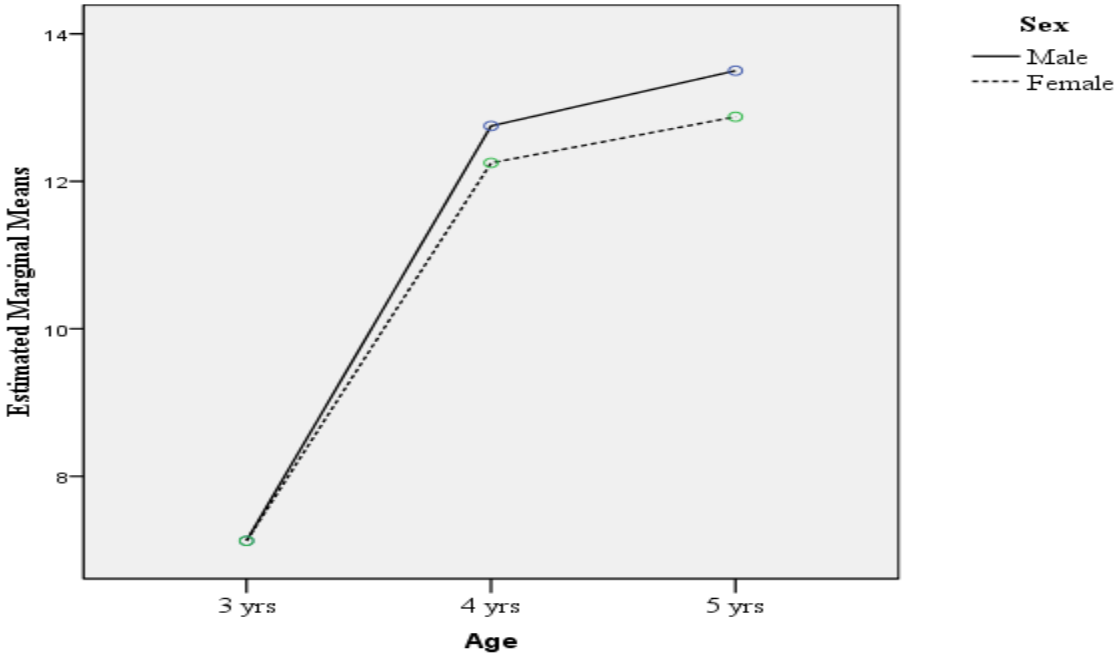


FIGURE 8: Estimated marginal means of the bilabial stop

The other common bilabial sound is the nasal, /m/, which was tested systematically in different word positions. In clustering, it was checked for the occurrences in a word medial position as a first and/or a second member. So, it was correctly uttered by the entire participants in every position (excepting some deviations). Indeed, the sound was almost produced without an error in the majority of the first group children's

productions (more than (86%) of the entire utterances). That means for children acquiring Oromo, acquisition of a bilabial nasal is complete approximately at or before three years of age.

The labiodental fricative voiceless /f/, which was included in the inventory of all the age groups, properly appears mainly word-initially and finally. At the word medial position, the sound can appear as a cluster creating either a geminate or a cluster being the first or the second member and hence tend to be surfaced phonetically as /Φ/ while making the first member, distorting it to get a simplified central fricative sound. However, no distortion followed being the second member. EXAMPLE (12) demonstrates some of the realizations in different positions of a word.

(18)

Input	**Realized**	**Gloss**
/k'erriffa:/	[kerifa:]	'canine'
[t^{w}o:fta:/	[t^{w}o:Φta:]	'tactic'
/danfa/	[daŋfa]	'sweat'
/farḍa/	[faḍ̂ḍ̂a]	'horse'
/kana:f/	[kana:]	'for this reason'
/t'a:fi:/	[ta:fi:]	'an endemic cereal in Ethiopia' (t'eff in Amharic)

In each of the above occasions, the sound has a distinct distribution. In the first and last example, it takes word medial position and appears in children's utterances as a target labiodental fricative. In fact, gemination was removed by a few participants of the first group as shown in the first example. That means, despite the accuracy of their production, some participants (mainly from the first group) simplified the geminate into a singleton consonant by missing the other member. In the second and third attestations, the sound emerges as cluster making, respectively a first and second member. During the production of the sound as a first member in a cluster as in [to:Φta:] 'tactic' the

sound mainly drops some of its actual features and became a central sound, retaining the fricative feature while in /danfa/ 'sweat' it has, however, got its actual realization in spite of spreading its feature to the preceding adjacent nasal. Generally, a large proportion of the children within the first, second, and third groups have acquired the sound.

Furthermore, /p'/ and /w/ are sounds produced by (81.25%) of the first category participants (88.39% of accurateness); where approximately all the children in the group properly produced the sounds in the initial and medial position of a word. In Oromo, the sounds tend to appear both in word-initial and final positions. Even if the glide never occurs with different consonants either as first or second member in clustering, the ejective rarely makes a cluster member. Yet, word-medially, there was a possibility of occurring as geminates (in fact, the glide has no contrastive singleton and is always used in its geminate form in the language) and thus were acquired by the majority of the participants before the age of four. Here are some of the children's utterances.

(19)

Input	**Realized**	**Gloss**
/wara:bessa/	[wara:βessa][9]	'hyena'
/k'awwe:/	[k'awwe:]	'weapon'
/p'a:p'alo:/	[p'a:p'al^{w}o:]	'a type of cranberry bean'
/lapp'e:/	[lapp'e:]	'chest'

4.2.1.2. Acquisition of alveolar sounds

The language has six types of sounds named as alveolar sounds; these are the fricative and nasal (/s/ and /n/), stops (/t/ and /d/), liquids (/l/ and /r/), and the implosive as well as

[9] Note that [wara:βessa] can as well be realized as [wara:βeʃʃa] spirantising the stop, and palatalizing the alveolar fricative.

the alveolar ejective sounds /ɗ/ and /t'/, respectively. All these sounds were acquired by Oromo speaking children before the age of four except the fricative /s/, the voiced stop /d/, and the flap liquid. From the stops, /d/ seems to have been a bit complicated to accurately utter in all positions of a word; in most instances, it takes a laminal feature contrasting the apical nature of the adult target.

[d]				Sex		
				F	**M**	**T**
Acquired	**Age**	3	N	7	4	11
			%	87.5	50.0	68.8
		4	N	8	7	15
			%	100	87.5	93.8
		5	N	8	8	16
			%	100	100	100.0
	Total		N	23	19	42
			%	95.8	79.2	87.5
Distortion	**Age**	3	N	1	4	5
			%	12.5	50.0	31.3
		4	N	0	1	1
			%	.0	12.5	6.3
	Total		N	1	5	6
			%	4.2	20.8	12.5

Table 11: Realization of alveolar stop across groups

To ascertain if the differences are statistically significant, a two-way between-groups analysis of variance was conducted. The result showed a statistically significant main effect merely for age [$F(2, 42) = 8.527$, $p = 0.001$], considering $p < 0.05$ for all these measures, with large effect size on the acquisition (eta square = 0.289) although not significant for sex [$F(1, 42) = 0.455$, $p = 0.504$] having small effect size (eta square = 0.011). Interaction effect for age and sex was also computed and resulted [$F(2, 42) = 0.127$, $p = 0.881$] indicating no significant difference of age on the production accuracy

of children with respect to sex. The result seems implausible when triangulating the result with estimated marginal means as shown in FIGURE 9.

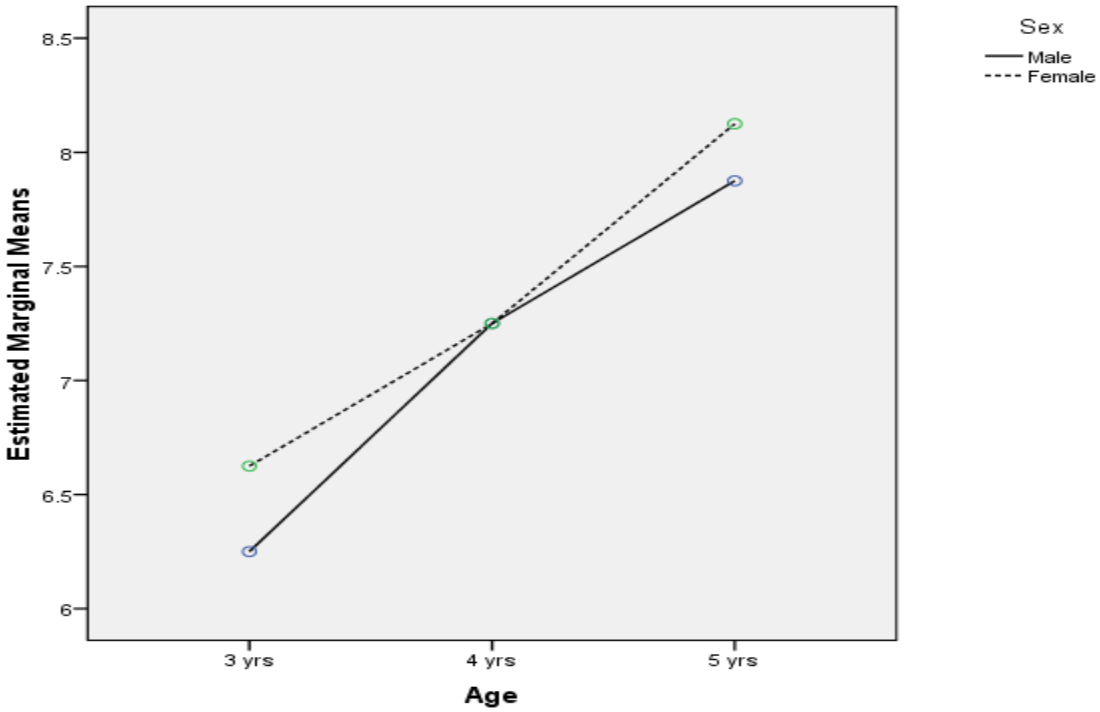


FIGURE 9: Estimated marginal means of the alveolar stop

The other difficult sound was observed to be the flap, /r/, before four years. Even at the age of four, just about (20%) of the children in the age group incorrectly uttered the sound. They tend to substitute the sound (either by assimilation or distortion) using a different sound, or delete/silence the actual sound (e.g. they sometimes produce [ʔafur] 'four' by omitting the consonant occupying the word-final position). Mostly, they tend to substitute with the alveolar tap [ɾ] or an approximant [ɹ] or the lateral [l] chiefly when it occurs as singleton or in clusters. Here are some of the realizations of the sound in different word positions.

(20)

/ra:ççа/	[ɹa:ççа] 'frog'
/marga/	[maɹga],[malga], [magga] 'grass'
/ɲa:ra/	[ɲa:ɾa] 'eyelid'

TABLE 12 generally summarizes the children's acquisition of [r] with respect to age and sex.

[r]				Sex		
				F	**M**	**T**
Acquired	Group	1	N	5	5	10
			%	62.5	62.5	62.5
		2	N	7	6	13
			%	87.5	75.0	81.25
		3	N	7	7	14
			%	87.5	87.5	87.50
	Total		N	19	18	37
			%	79.2	75.0	77.2
not Acquired	Group	1	N	0	2	2
			%	.0	25.0	12.5
		2	N	1	0	1
			%	12.5	.0	6.3
	Total		N	1	2	3
			%	4.2	8.3	6.3
distorted	Group	1	N	3	1	4
			%	37.5	12.5	25.0
		2	N	0	2	2
			%	.0	25.0	12.5
		3	N	1	1	2
			%	12.5	12.5	12.5
	Total		N	4	4	8
			%	16.7	16.7	16.7

Table 12: Realization percentage of the alveolar flap across groups

The table shows that two participants (entirely male) from the first and one female child from the second group have not acquired the sound while one male child each in groups one and three regularly distorted the sound. Additionally, three females of the first group normally distorted the sound. A two-way between-groups analysis of variance showed significance in effect for the age group [$F(2, 42) = 8.192$, $p = 0.001$, $P < 0.05$ for all these measures] but for the sex group did not reach statistical significance [$F(1, 42) =$

0.006, p = 0.938], while the effect size for both variables is large. Sex-age interaction with the speech sound accuracy was similarly computed that resulted in [F (2, 42) = 0.301, p = 0.742] illustrating no significant difference within the effect of age on sex of children, even if the estimated marginal mean for the two variables show an involvement of a possible interaction crossing through the points (see FIGURE 10).

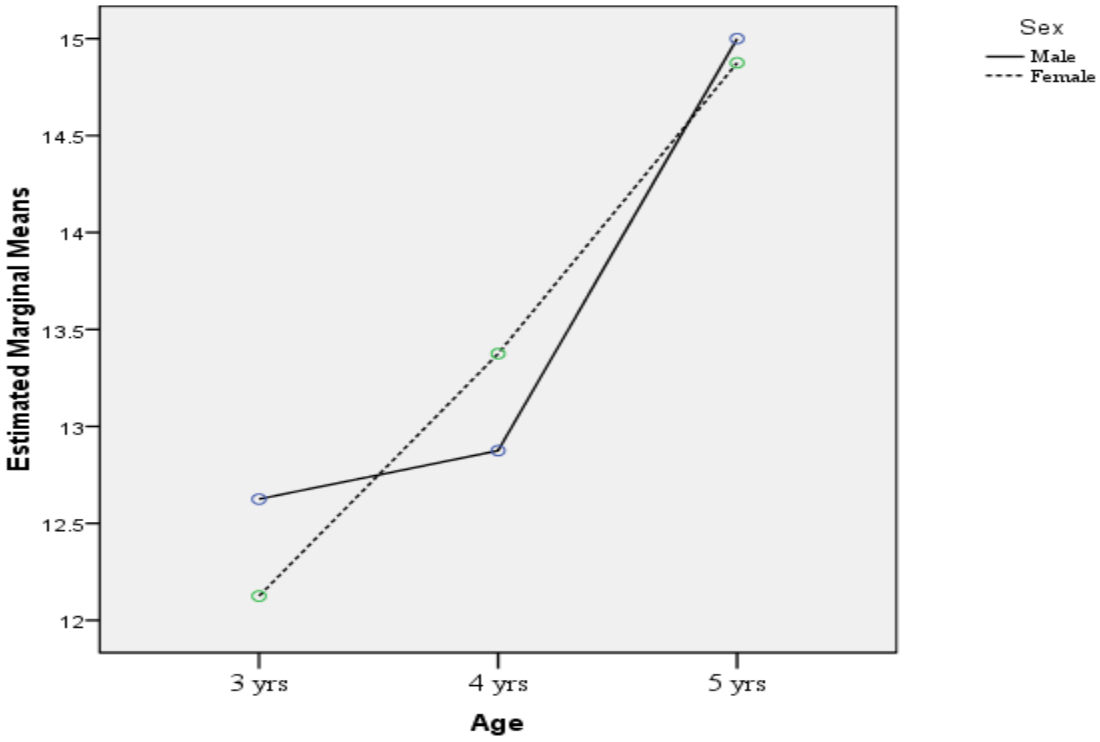


FIGURE 10: Estimated marginal means of the alveolar flap

The other fricative sound of the language is [s] that is realized in different forms. In the speech samples of the children under investigation, it was seen as inaccurate sound before the age of five. Its realization is mostly dentalized and/or palatalized. Dentalization of the alveolar fricative sound was considered in this study as distortion. Here TABLE 13 shows the category count of the sounds acquisition level from cross-tabulation.

[s]			Sex		
	Age Group		F	M	T
Acquired	1	N	4	2	6
		%	50.0	25.0	37.5
	2	N	6	5	11
		%	54.5	45.5	68.8
	3	N	7	6	13
		%	53.8	46.2	81.3
	Total	N	N	13	30
		%	%	54.2	62.5
Not Acquired	1	N	2	3	5
		%	25.0	37.5	31.25
	2	N	1	1	2
		%	12.5	12.5	4.2
	Total	N	N	4	7
		%	%	16.7	14.6
Distorted	1	N	2	3	5
		%	25.0	37.5	31.3
	2	N	1	2	3
		%	33.3	25.0	18.8
	3	N	1	2	3
		%	33.3	25.0	18.8
	Total	N	4	7	11
		%	16.7	27.2	22.9

Table 13: Percentage realization of the alveolar fricative across groups

Even though not omitted from speech samples; the sound was mainly replaced by either a dental or palatal sound. FIGURE 11 shows the frequency percentage of this sound's realization in their speech sample across the age groups.

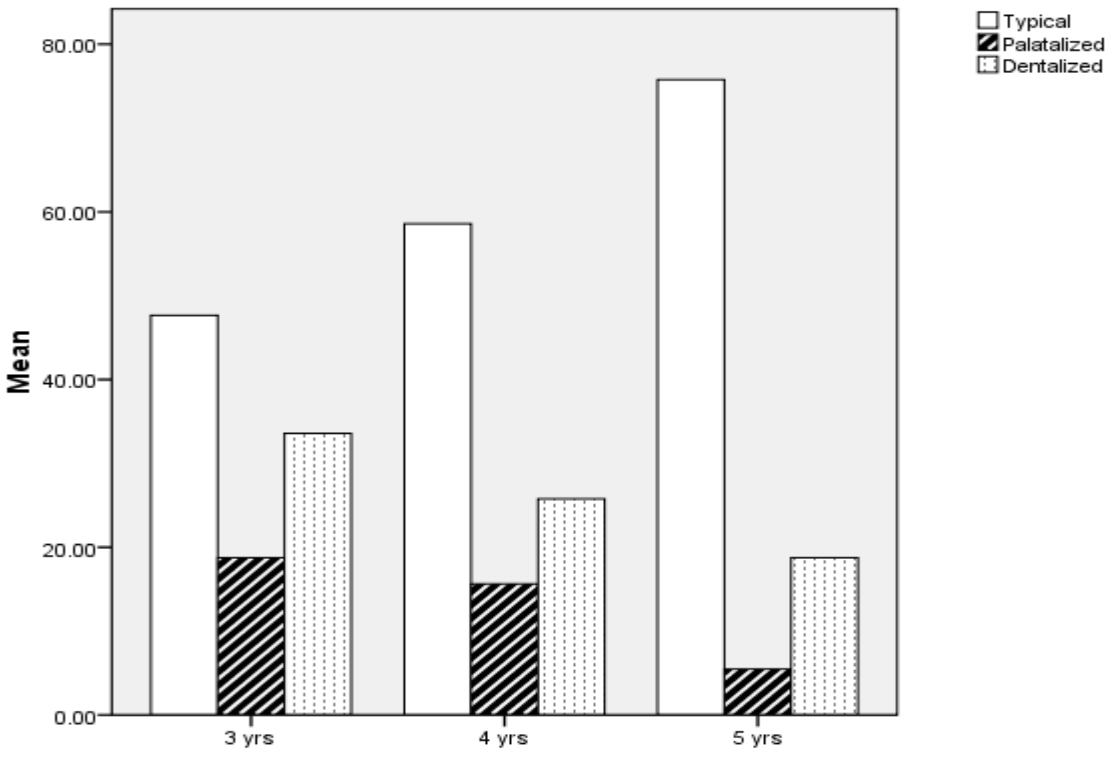


FIGURE 11: Realization of the alveolar fricative

For the percentage computation of the realization, the whole tokens of the children possessing the sound were considered and the realizations were sorted into typical (the exact input form), dental, and palatalized realizations. That means children's total tokens investigated within the age groups were sorted into any of the three realization instances. The FIGURE depicts that many children in the first age group have a propensity for substitution with either palatal or dental sounds followed by the second age group. Accuracy with the sound was recorded highest among the third age group. Explicitly, 122 (47.66%) from the first group, 150 (58.59%) from the second, 194 (75.78%) from the third group were recorded for the typical realization while the realization of the sound was not guided by the position of sound in a word. FIGURE 12 indicates the total deviations in terms of percentage.

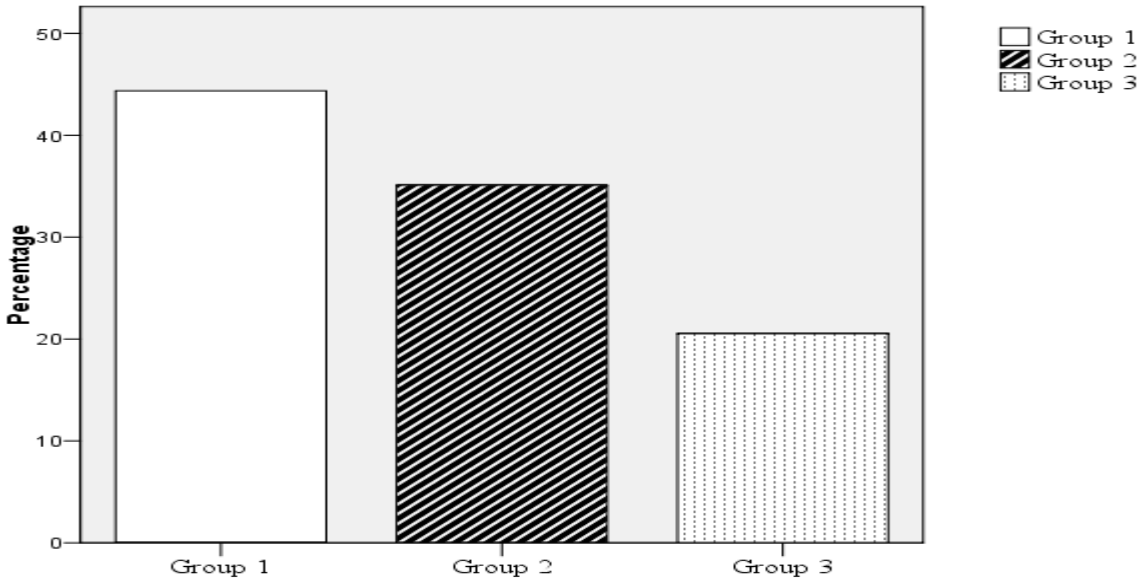


FIGURE 12: Alveolar fricative's total deviation from the adult target

From sex's point of view, female children's utterances look as if most precise within the three age groups from the counting. The impact of sex and age on the acquisition of the sound was explored using an analysis of variance but revealed a significant main effect only for the age group [$F(2, 42) = 45.107$, $p = 0.000$), $p < 0.05$ for all these measures, with strong/large effect size (eta square = 0.682). This means that the articulation accuracy between children in all the groups is significantly different, but the same is not significantly different between sex groups [$F(1, 42) = 0.143$, $p = 0.707$). In addition, the interaction of age and sex has no significant effect [$F(2, 42) = 0.250$, $p = 0.780$) and also has small effect size (eta square 0.12). However, estimated marginal means revealed a possible interaction as can be seen from FIGURE 13.

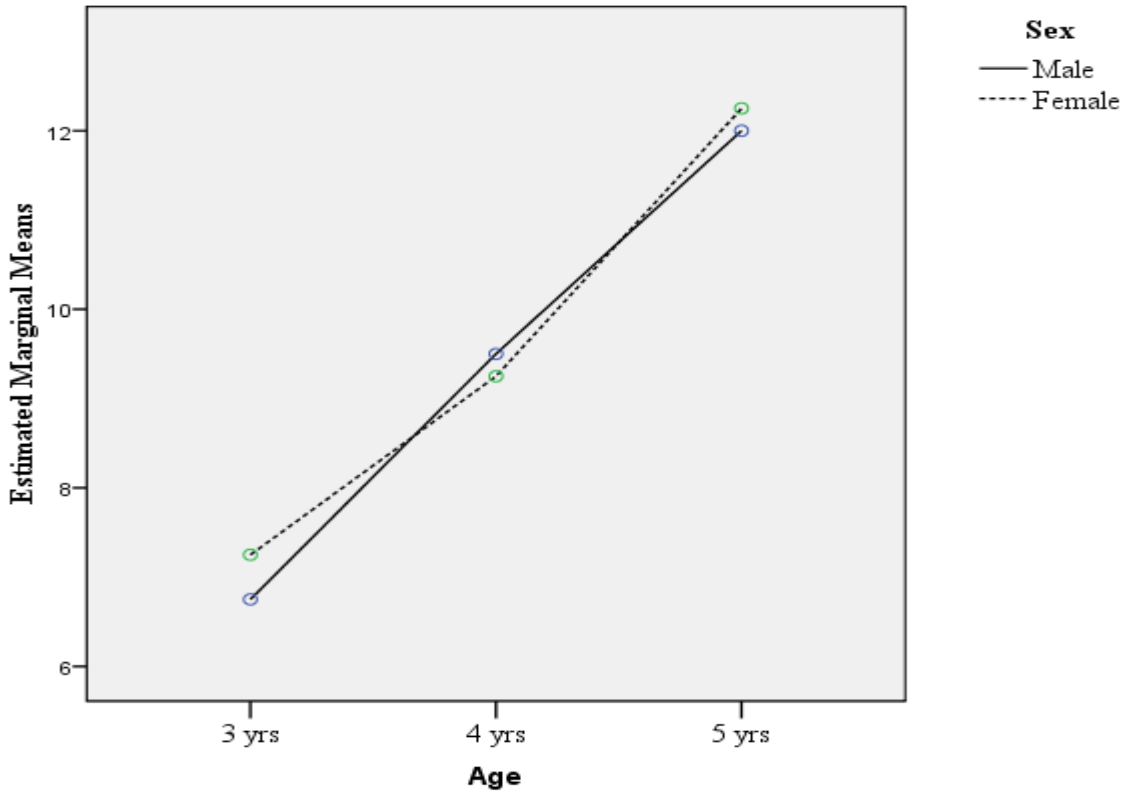


FIGURE 13: Accuracy of the estimated marginal means of the alveolar fricative

The implosive sound /ɗ/ and the ejective /t'/ (basically language-specific) are also sounds that all the age groups can simply produce at three years. Within children assessed, no distortion or simplification was investigated with the implosive sound, but de-glottalization was recorded with the ejective sounds. Some of the children assessed within-group one (three children constituting (18.75%)) frequently turned the sound into its weaker equivalent /t/, and the trend seems to be maintained until year four as it was recorded between two children (12.5%) in the second group.

4.2.1.3. Acquisition of palatals

Palatals are sounds that emerge with different manner and feature "when the front of the tongue is in contact with the hard palate" (Crystal, 2008). Oromo palatals consist of palatal affricates (/ʄ, ç/), palatal fricative (/ʃ/), palatal ejective (/ç'/), palatal nasal (/ɲ/), and a palatal glide (/j/) sounds. These sounds have varied frequency and distribution where children must acquire at different rates to reach the adult accuracy target. Of these palatal sounds, the ejective sound was not easily produced (mastered) by the children before their four years of age. In different occasions the sound emerged mostly as an affricate palatal (/ç/) deviating from its valid quality. Yet, all the palatal sounds of Oromo excepting the ejective were correctly produced by a majority of the children before their age of four or at their age of three (see group one's inventory from the summary table).

For the sounds, there are various cases of distributions. In line with the language's phonotactics, the fricative palatal, (/ʃ/), does not make a cluster with itself to become a geminate consonant. On the contrary, the affricate palatal (/ç/) and the nasal palatal (/ɲ/) never word medially happen as a singleton. Hence, it is not necessary to verify acquisition patterns for the incidences specified with these consonants. From these palatal sounds; only the ejective was counted less than 75% of accurate production in the first group's utterances.

[ç']			Sex		
	Age Group		**F**	**M**	**T**
Acquired	1	N	5	4	9
		%	62.5	50.0	56.3
	2	N	8	7	15
		%	100.0	87.5	93.8
	3	N	8	8	16
		%	100.0	100.0	100.0
	Total	N	21	19	40
		%	87.5	79.2	83.3
not Acquired	1	N	2	2	4
		%	25.0	25.0	25.0
	Total	N	2	2	4
		%	8.3	8.3	8.3
distorted	1	N	1	2	3
		%	12.5	25.0	18.8
	2	N	0	1	1
		%	.0	12.5	6.3
	Total	N	1	3	4
		%	4.2	12.5	8.3

Table 14: Realization of the palatal ejective

As indicated in the table, four children from the first group have not acquired the sound but three children (two female and a male) distorted the sound. The distortion was also recorded from one female child in the second group. The combined effects for age and sex groups with the sound accuracy were examined based on Analysis of Variance (ANOVA). The results indicated significant effect only for age group on the speech sound's accuracy, [$F(2, 42) = 4.004$, $p = 0.026$, $p < 0.05$) with large effect size (eta square = 0.16). That means children in the three groups, males and females do not vary in their acquisition accuracy. The result as well did not show statistical significance for the interaction effect [$F(2, 42) = 0.186$, $p = 0.831$) proving no variance in the effect of age on the acquisition of palatal ejective for males and females. From the conventional way of illustrating interactions using graphs in FIGURE 14, the lines through the points

are crossing and moving together indicating an interaction. For this reason, the finding of the statistical result seems improbable.

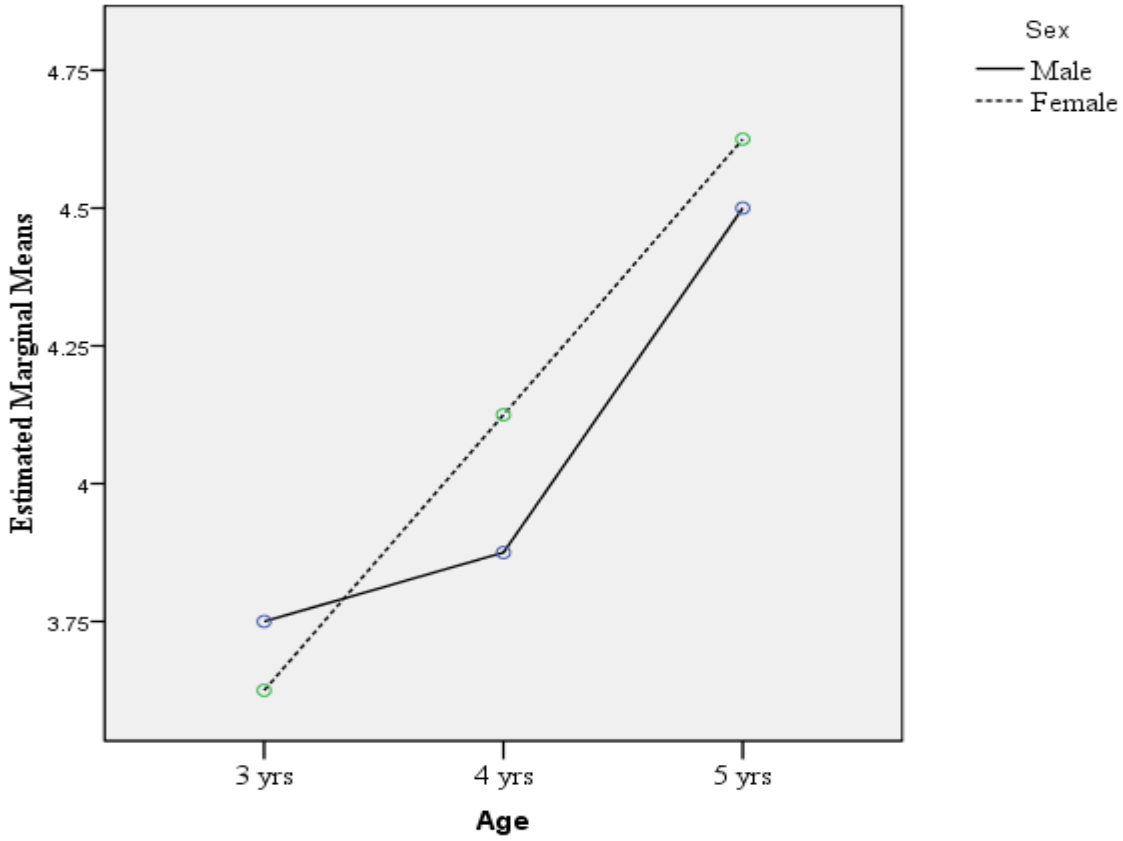


FIGURE 14: Estimated marginal means of the palatal ejective

Finally, the fricative and the nasal were acquired very early definitely before three years. With the sounds, so little mis-articulation was recorded. However, the affricate, [j], checked for accuracy across the age groups was seen to have some troubles even though acquired by a greater proportion of the children in all groups. The sound can occur in word-medial and initial positions. Word medially, it may happen as a singleton or the second member in a cluster. In these positions, children seldom distorted or misarticulated the sound to either the alveolar affricate or an indeterminate sound. Gemination of this sound was tested by a word [hojja:] ‘length’ where they uttered

appropriately in repetition tasks, indicating their acquisition of the sound pattern at their age of three.

4.2.1.4. Acquisition of velars and glottals

Velars are sounds produced further back in the roof of the mouth, with the back of the tongue against the velum; while glottals are sounds produced "without the active use of the tongue and other parts of the mouth" (Yule, 2006). In Oromo, glottals and velars are of two kinds from the perspective of their manner, namely velar stops (/k, g/) and velar ejective (/k'/) sounds; while glottals can be categorized into stop (/ʔ/) and fricative (/h/). Despite their early acquisition, the stop velar sounds seem to alternate in different environments for the first group. The alternation they make even continues pending their age of four, but no variation was recorded with the third group. The other sound is the velar ejective /k'/ sound, which was not completed before their age of four.

[k']	Age		Sex		
			F	**M**	**T**
Acquired	3	N	6	5	11
		%	75.0	62.5	68.8
	4	N	7	7	14
		%	87.5	87.5	87.5
	5	N	8	7	15
		%	100.0	87.5	93.8
	Total	N	21	19	40
		%	87.5	79.2	83.3
not Acquired	3	N	2	3	5
		%	25.0	37.5	31.3
	4	N	1	1	2
		%	12.5	12.5	12.5
	Total	N	3	4	7
		%	12.5	16.7	14.6
distorted	5	N	0	1	1
		%	0.0	12.5	6.3
	Total	N	0	1	1
		%	0.0	4.2	2.1

Table 15: Realization of the velar ejective

As depicted in the table, only six female and five male children assessed (68.75%) in the study were seen to have acquired the sound. However, five children (two female and three males (31.25%)) have not totally acquired the ejective. Misarticulating of the sound was also evident in the speech of two children in the second group and one male child in the third group. At three years, they tend to deglottalize the sound turning it to one of the velar stops (either the voiced or the voiceless one).

Although we know that males and females differed in terms of the sound's production accuracy, the actual difference in the two mean scores is very small. ANOVA did not indicate statistical significance for sex group [$F(1, 42) = 1.528$, $p = 0.223$, considering $p < 0.05$ for all of these measurements) but its effect size was large (eta square = 0.35 for age and = 0.021 for sex). However, the analysis revealed a significant effect for age groups [$F(2, 42) = 19.090$, $p = 0.000$) with a large effect size (eta square = 0.476). The analysis additionally indicated no significant interaction effect of age on the sound's accuracy of males and females' production [$F(2, 42) = 1.207$, $p = 0.309$), but the eta squared statistic resulted (= 0.054) signifying a moderate effect size. Using the conventional way of illustrating interactions the lines through the points on the graphs in FIGURE 15 are crossing together indicating contradictory view.

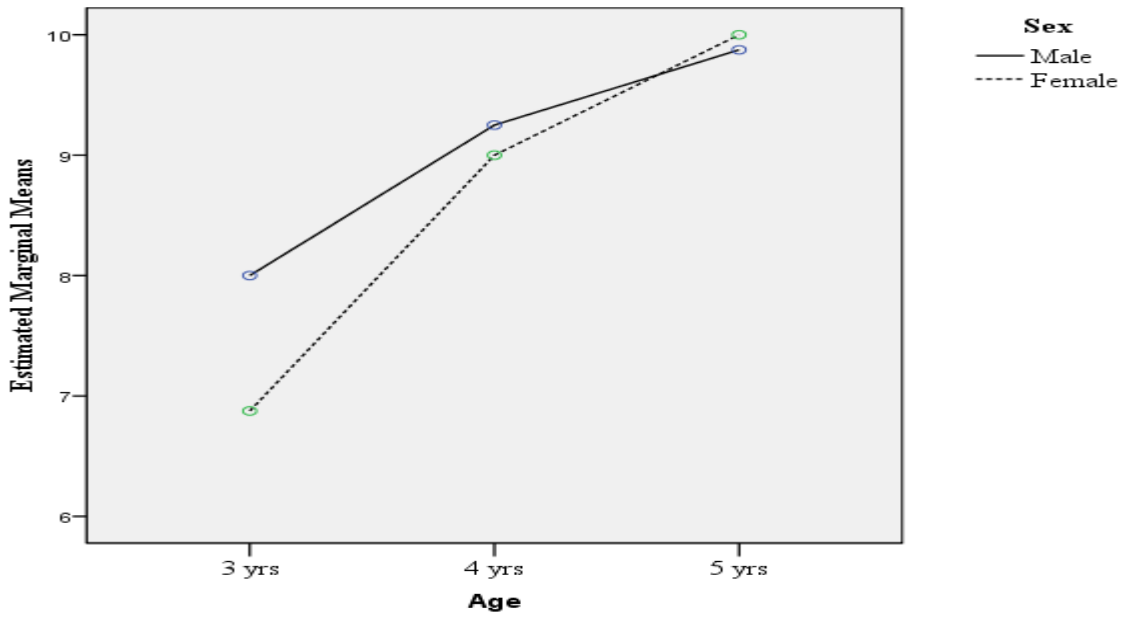


FIGURE 15: Estimated marginal means of the velar ejective

Concerning the glottal sounds, early acquisition of the glottal stop, /ʔ/, is expected in Oromo as it is often used in a syllable onset, seeing that onset-less syllables are proscribed. In fact, the fricative was also acquired early. In most instances (if not all) Oromo normally use its glottal sounds interchangeably at the word-initial position. Keeping this in mind, it was observed that the children in all the three groups alternate the sounds freely at a word-initial position even if it can be said that group one children can utter the sound easily in both positions of a word. Oromo may use the glottal as a second member in clustering. Yet, the entire group of participants never properly articulate the way intended. They totally assimilate the sound to a preceding sound (example, /ba:jʔe:/ can be [ba:jje:] 'many').

The fricative glottal sound is among sounds not occurring in the word medial position (Wako, 1981). However, initially, there was a possibility for the sound to occur either as itself or as a glottal stop due to the process of free variation in the language. From the participants, 11 children (68.75%) from the first, nine children (56.25%) from the second and 13 children (81.25) from the third group repetitively used the sounds

alternatively. The counting was made whereby the participants use a glottal stop instead of the glottal fricative in at least two instances of the target data; i.e. it was said to be fully used by a certain participant where the sound is employed on one occasion in picture naming (example [ʔinda:kk'o:] 'hen' for /hinda:kk'o:/) and on one occasion in repetition tasks (example [ʔaɗ̪a:] 'poisonous' for /haɗ̪a:/) at least. The use of this variation showed the inconsistency of percentage increase with age due to inexplicable reason; use of the process by the first group was almost equal with that of the third group while relatively fewer participants from the second group employed the process as can be observed from FIGURE 16.

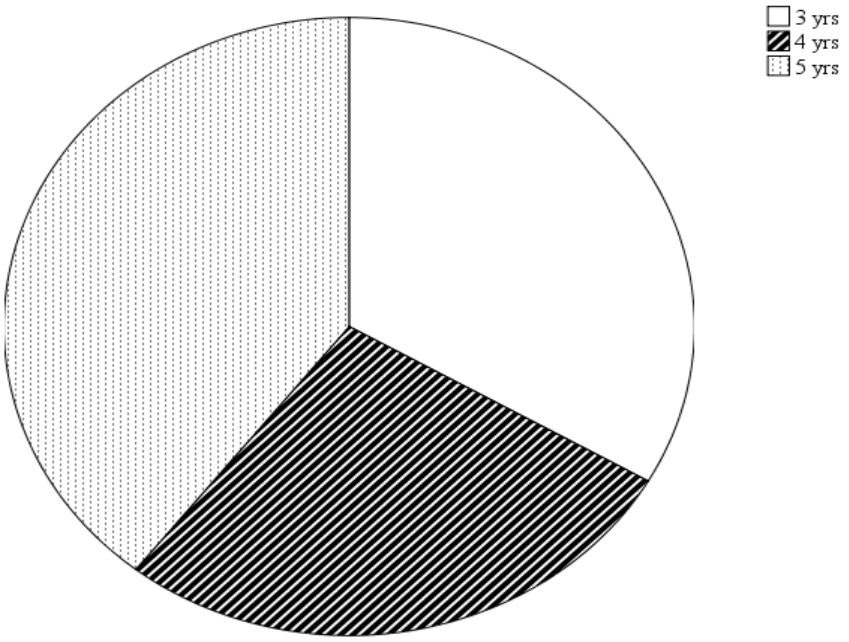


FIGURE 16: Children's frequencies of free variation of the glottal sounds

As indicated in the FIGURE, the frequency of the usage is superior with the first and third groups but decreased with the second. Comparing the highest frequencies, the use of the process by the third group is a bit higher than the first. Here are some of the words tested for the process and revealed the way indicated.

Target	Gloss	Realized	Target	Goss	Realized
/harka/	‘hand’	[ʔarka]	/harʔe:/	‘today’	[ʔarr̥a]
/harma/	‘breast’	[ʔarm̥a]	/hoǰǰa:/	‘length’	[ʔoǰǰa:]
/hinda :kk’o:/	‘hen’	[ʔinda:kk’o:]	/haɗɗa:/	‘poisonous’	[ʔaɗɗa:]

Table 16: Realization of the glottal sounds

This alternation is one-way, which means, in this position barely the glottal stop replaces the glottal fricative; whereas the replacement of the glottal stop with the fricative in the same position was not recorded. In fact, it is not the way Oromo users employ the pattern and accordingly, children do not get a similar input to use the variation. For instance /ʔija/ ‘eye’ was not detected being realized as [hija] at least once by the three groups.

4.2.1.4. Summary

All the participants were able to produce the majority of the sounds in different word positions. Some sounds produced at the word-initial position could not be correctly uttered in the word medial or final position or the other way round. In most cases, the participants' performances of most sounds in word-final position were not tested due to an insignificant number of special phonemes normally occurring in the position. The analysis of the phonemes produced indicated that all the three age groups produced the entire five vowels in word medial and final positions. Besides, the bilabials /m, f, p’, w/, were produced by all the participants of the three groups in word-initial and medial positions notwithstanding some phonological processes.

The participants were also able to produce correctly the alveolar nasal /n/ in word-initial position while 87.5% were able to produce it in word medial position. Despite its specificity in the language, the alveolar implosive was also considered as acquired by all the participants in the first group. Ejectives /t’/ and /p’/ were included in the inventory of the three groups as the majority of the participants were capable of producing the sounds

in different word positions. From the assessment within the three groups, only 4.2% (2 children) seem to have been not acquired from the first group while one child (2.1%) frequently distorted the sound.

All the palatals and velars except the ejective sounds /ç'/ and /k'/ were considered to be acquired by more than (¾th) of the participants in the last two groups. Only 11 children (68.75%) from the first group acquired the velar ejective. The glottal sounds, on the other hand, were completely acquired by the three age groups. Generally, TABLE 17 shows a summary of the inventory of phonemes for the children within the three age groups depending on the 75% criteria of inclusion.

Group	Lists of Phonemes					
	Vowels	**Labials**	**Alveolars**	**Palatals**	**Velars**	**Glottal**
1	i, e, a, u, o	/m, p', w, f/	/t, t', n, ɗ, l/	/ʃ, j, ɟ,ç, ɲ /	/k, g /	/ʔ,h/
2	*C	/b/	/d, r/	/ç'/	/ k'/	*C
3	*C	* C	/s/	*C	*C	*C

* Completed

Table 17: Inventories of the phonemes

In general, the entire sample of the phonetic inventory implies that most of the consonants and all the vowels in Oromo are acquired as early as 3 years of age. Majority of the participants in the first category were able to produce 24 phonemes of which five are vowels. Note that the analysis of the phonemes produced indicated that all the five vowels of the language (irrespective of length) were produced in word medial position by the three categories signifying the sounds' early acquisition.

4.2.2. Acquisition of consonant clusters

It is pointed out that a cluster of consonants is allowable only in word-medial position and consonants singly take word-final position in Oromo (Wako, 1981). Even if it is difficult to know the exact number and type of clusters in the language, the study tried to include the majority of its clusters types (39 types constituting 46.99% of the target words) to assess the production accuracy of the participants with each of the cluster types. Table 18 shows the complete varieties of C_1C_2 clusters in Oromo. Examining the status of sonorants in the phonological system of Oromo clusters, it has Sonorant-Obstruent, Obstruent-Obstruent, Obstruent-Sonorant, and Sonorant–Sonorant clusters.

Cluster type	**Blends in Oromo**
Sonorant-Obstruent	
Nasal-Stop	(mb, mʔ, mt, ng, nt, nd, nk)
Liquid-Stop	(lb, ld, lg, lk, lʔ, rb, rd, rg, rk, rt, rʔ)
Glide-Stop	(jʔ)
Liquid-Fricative	(rʃ, ls, lf,rf,rs, lç, rj)
Nasal-Fricative	(ms, nf, ns, nj
Liquid-Ejective	(lp', lt',lk', rk', rt')
Nasal-Ejective	(nç', nk')
Obstruent-Obstruent	
Stop-Stop	(gd, bd)
Stop-Affricate	(bj)
Stop-Fricative	(bʃ, bs, ks)
Fricative-Stop	(ft)
*Obstruent- Sonorant**	
Fricative-Glide	(fw)
*Sonorant – Sonorant**	
Nasal-Nasal	(mn)
Liquid-Nasal	(rm, lm)

Table 18: Cluster types in Oromo

* Occurrences of the cluster types are rare in the language

In the language, all the second member consonants in clusters (C2) are affiliated with obstruents except for the sonorant-sonorant cluster type wherein C2 come to be a nasal sound. In their sonorant-obstruent cluster, the language uses three cluster types; nasal-stop, liquid-stop, and glide-stop with a total of 19 combinations. The nasal-stop cluster type has nasal C1 and stop C2 where [m] and [n] were the only nasals, respectively engaged in the cluster pattern of the language. The bilabial and glottal stops constitute C2 with the labial nasal, while the alveolar [d], the velars [g] and [k] may become the alveolar nasal's C2. However, [t] can be the second member of both sounds. In the obstruent-obstruent, the language employs stops as C1C2, stops with fricative in whichever order and C1 stop with affricate C2. Finally, in the blends of Obstruent-Sonorant and Sonorant-Sonorant, fricatives and nasals make, respectively C1 of the clusters while stop and nasals make the second member. The palatal nasal, on the other hand, is realized as a first member-only phonetically with C2 palatal ejective and affricate sounds.

4.2.2.1. Patterns of cluster acquisition in Oromo

When children acquire clusters some language-specific occurrences must be handled. In view of this, children's attempted targets containing some possible clusters are examined based on cluster type to observe the patterns in the acquisition of clusters in Oromo. For this purpose, cluster types are delineated as different blends of adjacent manners of consonants. So, regardless of accuracy in utterances, the following cluster types were attempted for their respective blends in the language.

Cluster type	Blends in Oromo	Some Realizations
Nasal-Stop	(mb, mt, ng, nt, nd, nk)	(mb, mt, nt, ŋg, ŋk)
Liquid-Stop	(lb, ld, lg, lk, rb, rd, rg, rk, rt, rʔ)	(bb, dd, gg, kk, tt, rr)
Glide-Stop	(jʔ)	(jj)
Liquid-Fricative	(rʃ, ls, lf, lç, rj)	(ʃʃ, lʃ, ss, ff, ʃʃ, rj)
Nasal-Fricative	(ms, nf, ns, nj	(ns, ŋf, ɲj
Liquid-Ejective	(lp', lt', rk', rt')	(pp', tt', kk', tt')
Nasal-Ejective	(nç', nk')	(ɲç', ŋk')
Stop-Stop	(gd)	(dd)
Stop-Affricate	(bj)	(pj)
Stop-Fricative	(bʃ)	(fʃ, fs)
Fricative-Stop	(ft)	(Φt)
Nasal-Nasal	(mn)	(ŋn)
Liquid-Nasal	(rm, lm)	(mm, ɹm, ɾm, lm, (l)m)

Table 19: summary of the children's attempt of the cluster types

Yet, some of the rare clusters in the language were not attempted for the cluster types were accidentally not targeted, and in all their utterances of the clusters, no segment reduction was observed while some clusters were inaccurately produced conflicting with the adult realization. In their attempt, children exhibited systematic mis-articulation with regards to certain C_1 sounds apart from nasals. Further, some of their realizations with clusters are adult-like where dialectal phonological processes are employed. For instance, the alveolar nasal preceding all velar consonants gets realized as a velar nasal in both adult and child speeches; as a result of velarization.

Normally, in their attempted production, they produced C_1 nasals effortlessly with different sounds. Nonetheless, no segment was detected being removed from the blends to simplify the cluster owing to children's development. Taking OT into account, this is a completely different strategy that can be characterized as the ranking of faithfulness

constraint MAX over the markedness constraint IDENT I/O, as the procedure fulfils the faithfulness constraint ruling out all deletions; but violates the markedness chiefly disfavouring some inconvenient sounds differing from its input.

Therefore, two categories of productions were counted for each cluster set for the purpose of comparison between the cluster types. These are the correct production and adaptation processes. In this study, children acquiring the language, as a result, employed one of these categories of production. Note that in the adaptation process they hardly ever applied the strategy of reduction as no segment was removed from the clusters. Hence, in TABLE 20 the percentage for each phenomenon was calculated out for each cluster type. Counted correct productions in the table are not only the target input types but also the phonological process employed to the clusters by adults. In addition, having a certain feature was also counted as correct (for example, in the liquid-stop cluster, children's realization of the lateral for flap sound was tolerated due to appropriate existence of a liquid feature).

Cluster type	Tokens	TT	% of Correct production					
			3 yrs	%	4 yrs	%	5 yrs	%
Nasal-Stop	6	96	71	73.96	80	83.33	91	94.79
Liquid-Stop	10	160	60	37.50	102	63.75	134	83.75
Glide-Stop	1	16	12	75.00	14	87.50	15	93.75
Liquid-Fricative	5	80	58	72.50	62	77.50	73	91.25
Nasal-Fricative	4	64	49	76.56	51	79.69	55	85.94
Liquid-Ejective	4	64	35	54.69	46	71.88	52	81.25
Nasal-Ejective	2	32	26	81.25	27	84.38	29	90.63
Stop-Stop	1	16	-----	-----	-----	-----	-----	-----
Stop-Affricate	1	16	9	56.25	11	68.75	15	93.75
Stop-Fricative	1	16	11	68.75	13	81.25	14	87.50
Fricative-Stop	1	16	10	62.50	14	87.50	16	100.00
Nasal-Nasal	1	16	13	81.25	16	100.00	16	100.00
Liquid-Nasal	2	32	15	46.875	22	68.75	27	84.37
Mean	1.63	26.11	16.21	19.57	21.77	58.52	72.46	82.25
SD	2.74	43.82	23.40	30.85	38.83	16.18	14.00	14.33

Table 20: Correct production of the clusters across age groups

The table indicates that the acquisition of consonant clusters seems to be completed mainly at the age of five. Besides, the stop-stop cluster was equally realized in the speech of adults the way all the children produced and thus 'precise' (if imprecision possibly be considered precise) and it was not totally counted; for they replaced the first member velar C_1 sound (/g/) with the alveolar C_2 (/d/) in their attempt to pronounce a word /dugda/ 'back'. Again, C_1 liquids were very rarely produced fitting its input productions. Commonly, the children's cluster acquisition was observed to be incomplete for all the cluster types owing to diverse simplification strategies. The strategies alter the forms of the output from the input form which is not actually random but results from a phonological system that wants certain contrasts of features and

interaction between segments (Demuth, 1997). Therefore, this section thoroughly discusses variability in the application of simplification strategies.

Note that C_1 of the language's sounds were chiefly of two kinds: obstruents (stop, fricative, and ejective) and sonorants (nasal and liquid). Maximum and minimum correct production categories were recorded with nasals and liquids (particularly the flap), respectively. The sonorant-obstruent cluster was acquired generally at the end of five years. From the cluster types, the nasal-stop seems to be the earliest acquired cluster type due to early acquisition of nasals while the liquid stop appears to be the very last. Three years children of Oromo speaking appropriately produced four of the six nasal-stop cluster combinations, but none of the liquid-stop, liquid ejectives and Liquid-Fricative except the one with a palatal fricative.

Again the nasal-fricative was totally misarticulated by simplifying the sonorant's place feature. They totally shifted the actual C_1 place to that of C_2's place of articulation. For example, /ms, nf, nj/ were realized chiefly as [ns, ɱf, ɲj], respectively. In each case the first member resembles the second sound in its place of articulation. The other sonorant-obstruent cluster type was glide-stop, where the palatal glide (C_1) and the glottal stop make a cluster. All the participants in each group (I can say) totally replaced the glottal stop with the palatal sound creating a geminate sound. This assimilation strategy was not only observed in sonorant-obstruent cluster types but also in obstruent–obstruent clusters. From cluster types arising from this order stop-stop, for example, first member velar and labial sounds completely received the feature of the second consonant to become identical.

From the other perspective, children may favour manner feature of a certain sound to the other for the ease of cluster production. For instance, in the stop-fricative of the obstruent-obstruent cluster type children entirely misarticulated in preference of a certain manner feature. In combinations of sounds such as /bʃ, bs/ their realization was

observed to be [f] in place of /b/ turning out the stop into a fricative, undergoing a process termed as spirantization. The percentage of the children's error realizations related to the types with sonorant-obstruent cluster was generally summarized in FIGURES 17 - 18.

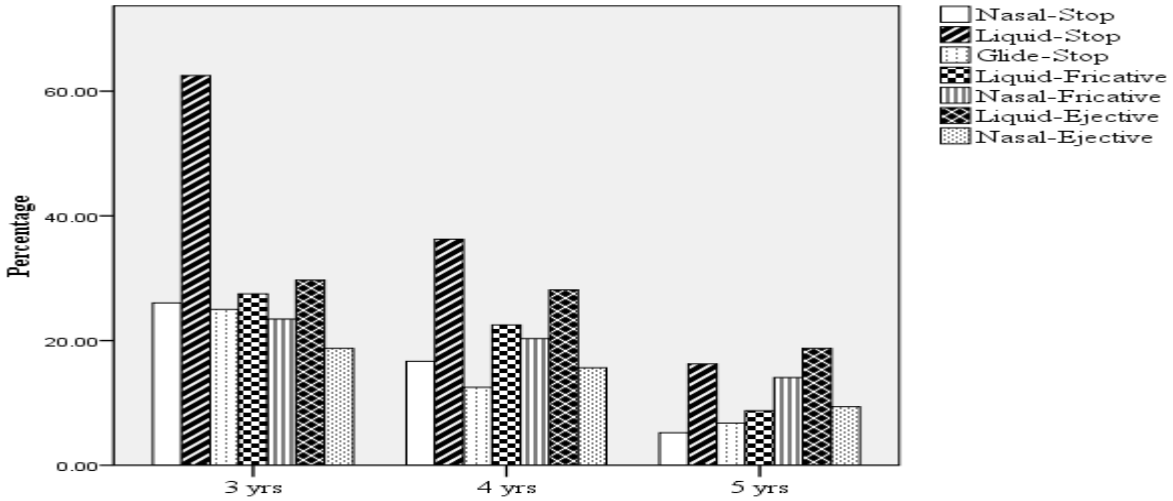


FIGURE 17: Errors of the sonorant-obstruent cluster types

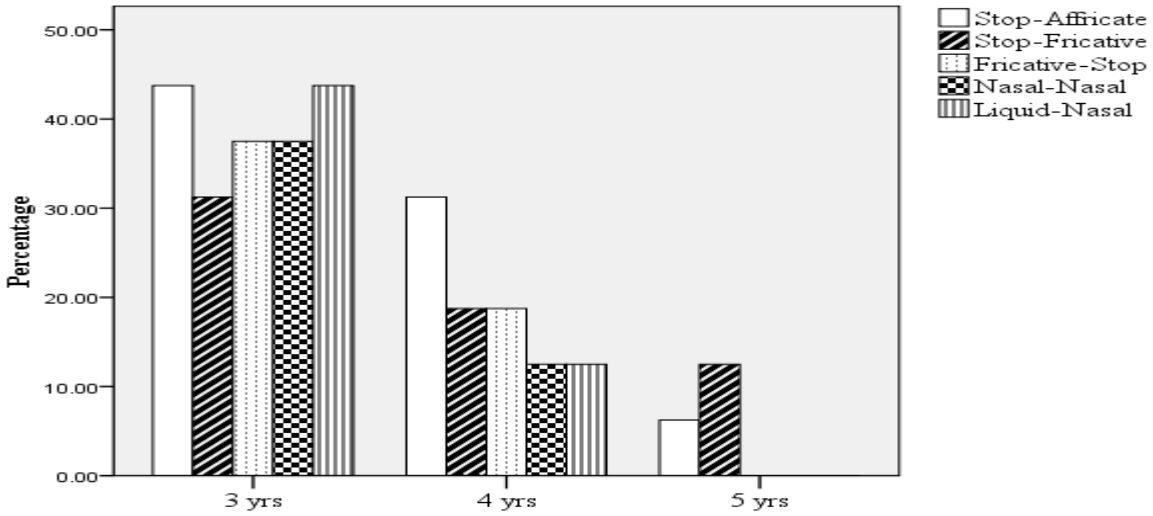


FIGURE 18: Errors of the obstruent-obstruent/sonorant-sonorant cluster types

Cluster types constituting liquids need very special consideration for their delayed acquisition. Interestingly, liquids are the most prevalent first members in the language's

consonant cluster, but not preferred for their complexity at first and chiefly assimilate to the subsequent sound (nasal or obstruent) as shown in TABLE 20. Mis-articulation of clusters with liquid constituent existed in the speech of the three group participants. When liquids make C_1, many of their utterances were essentially substituted with C_2 to produce its geminate provoked by difficulty uttering the cluster in its input form.

Target	**Gloss**	**Realized**	**Target**	**Gloss**	**Realized**
/k'arʃi:/	'money'	[k'aʃʃi:]	/ʔilka:n/	'teeth'	[ʔikka:]
/farda/	'horse'	[fadda]/[falda][10]	/silmi:/	'tick'	[simmi:]
/harka/	'hand'	[ʔ/hakka]	/ʔurji:/	'star'	[ʔujji:]
/marga/	'grass'	[magga]	/salp'a:/	'easy'	[sap'p'a:]

Table 21: Children's attempt of liquids in a cluster

In the examples, it can be observed that the children employed geminates of C_2 while occurring in clusters with C_1 liquids. In this study, majority of the participants in the first age group applied this assimilation/substitution technique than deleting the apparently difficult sound from the structure (liquids in this case). This tendency continues with the second and third group, which shows the persistence of the process until their five years of age despite decrements in frequency. From the liquids, the lateral sound is mostly favoured while the flap is not.

On the whole, the children do not just reduce clusters to produce singleton. Rather they select one of the consonants (generally C_1) and make some adaptations to the sound for the simplicity of the production. What accounts for this preference of a segment must be carefully analysed. Firstly, from the acquisition pattern of the children under investigation, it is clear that they preferred obstruents and nasals to liquid consonants (for example). In determining their preferences for the substitution of sounds in cluster

[10] This kind of articulation (replacing the flap with lateral) was manifested mostly when a flap sound approach complete accuracy. The strategy is mainly common within the second group.

acquisition by Oromo speaking children, ideas arising from the status of sonority distance must be considered.

All speech sounds have been universally assigned numerical value to represent their degree of sonority (Wyllie-Smith, Mcleod, & Ball, 2006), while various experts developed dissimilar value for categorizing the sounds into different groups with different numerical standards (Brown T. , 2012; Yuen, Miles, Cox, & Demuth, 2014). For example, Clement's (1988) included five natural classes of sonority scales based on a decreasing level of sonority: vowels, glides, liquids, nasals, and obstruents. When numerical values are assigned to the classes, vowels were given the highest and obstruents the least that appears as follows.

(21)

Vowels	>>	Glides	>>	Liquids	>>	Nasals	>>	Obstruents
5		4		3		2		1

Indeed, others suggest a further classification of the sounds' classes (e.g. stops into voiceless and voiced depending on voicing feature). In this study, this five-point scale for index representation will be used to evaluate their acquisition pattern for the basic distinction where obstruents comprised sounds such as fricatives, affricates, ejectives, and stops with one accord.

Depending on the index, Oromo speaking children's early words exhibit a preference for the least sonority consonants caused by the dominance of markedness over faithfulness (Demuth, 1996) leading to the preference for unmarked structures (Jakobson, 1968) in the initial grammar. So, which markedness constraint dominates which faithfulness constraint for Oromo speaking children's cluster acquisition? Specifically, what makes /k'arʃi:/ to be realized as [k'aʃʃi:] or [kalʃi:] in the speech of the children. To do the analysis, considering the sonority of the sounds, let's identify the basic faithfulness

constraints being violated. Replacing the flap liquid with the palatal fricative removed its manner feature decreasing the sonority from three to one considering Clement's five-point scale. The relevant ranking for this pattern is {MAX, *LO}>>FAITH (Ident [F]) for any replacement of the more sonorous consonant with the least sonorous in the cluster.

(22)

Ident[$_F$]	Corresponding segments in input and output forms must be identical in the composition of a feature.
Max [$_{seg}$]	Every Input segment has an Output correspondent.
*LO	One violation in the output for every obstruent preceded by liquid.

Kager (2004) indicates that the complete assimilation of two non-identical segments typically implicates the violation of Ident [$_F$] constraints. With the replacement of obstruents in preference to sonorants also violated Ident[$_F$] in Oromo due to lack of feature resemblance. For the time being, I shall identify this constraint as FAITH. The faithful candidate [k'arʃi:] is less harmonic than [k'aʃʃi:] for the children since they disfavour liquid elements in a cluster (high sonority segment). From this, it follows that *LO (the constraint that is violated in the 'losing' candidate (disfavouring sonorous sound)) dominates FAITH (the constraint that is violated in the 'winning' candidate). Since the language frequently uses nasals and sonorants mainly as a first member, output forms with obstruents are not faithful to the input violating the FAITH constraint. The following tableau proves this ranking argument assuming that there are no other constraints or candidates in the utterances of the children acquiring Oromo.

(23)

Input: /k'arʃi:/	*LO	FAITH
☞ a. [k'aʃʃi:]		*
b. [k'alʃi:]	*!	*
c. [k'arʃi:]	*!	

In this tableau, there are three candidates for evaluation against the two set constraints: the markedness *LO and faithfulness FAITH. The candidates have not deleted or inserted a segment, but the precedence structure is not maintained in the output of the first two candidates. In the competition, (a) and (c) performed better than (b), respectively on constraints *LO and FAITH. For the first candidate faithfulness constraint was violated although markedness was valued.

Depending on the higher ranking of the constraints, markedness outranks the faithfulness and thus candidate (a) became an optimal output of the children's first words with this cluster types, i.e. candidate (a) is the winner. This is because of the children's preferences of the obstruents. Candidate (b), on the other hand, is a loser for not beating its competitors in either ranking of the two constraints. Still, the candidate can be a winner in some instances, especially when children come closer to mastery of the cluster types despite its violation of the two constraints. How? It is because (b) is not harmonically bounded by (a) or (c) since (b) does have a proper subset of (c)'s violation. At the same time, the markedness constraint is a loser preferrer, favouring candidate (b).

In their initial grammar with the liquid-C cluster, the liquids (generally higher in sonority) were largely disfavoured. Then again liquids are not equally favoured. For instance, /farda/ 'horse' was either realized as [fadda] or as [falda] with some participants within the three group participants. This implies that there must be a domination hierarchy in the stratum even though assigned a similar sonority value, namely, flap/tap and lateral with unequal preference. The preference comes due to re-ranking of the markedness constraint. Given the availability of these surface forms, what constraints are ranked above the other to bring about the realization?

To answer this question, it is essential to take the constraint demotion algorithm of Tesar and Smolensky in trying to design constraint ranking from the violation (Tesar & Smolensky, 2004). The algorithm was built on the crucial impression that violated

constraints must be dominated in the optimal output by some other constraint (Kager, 2004). It compares an observed output (presumed to come from a mature speaker) to any candidate erroneously rated as optimal under the learner's current constraint ranking. Tesar & Smolensky (2004) observed that the algorithm starts with all constraints unranked with respect to each other, and all winner-loser pairs unexplained.

Therefore, the pair has to been successfully explained to demote the loser-preferring constraint, freeing up some constraints for ranking in the subsequent stage. In the beginning, children substitute the flap liquid by some other obstruent sound to go further down in the sonority index next to the highest sonority scale (vowel). We conclude from this that *LO must be ranked lower than constraints which are violated by losing candidates resembling in feature and proximity to the flap.

This principle applies through 'constraint demotion' that works with the space of stratified hierarchies to specify rankings of the dominance relation between two constraints as shown in the following representation.

(24)

Stratified domination hierarchy

$\{C_1, C_2, \ldots, C_3\} >> \{C_4, C_5, \ldots, C_6\} >> \ldots >> \{C_7, C_8, \ldots, C_9\}$

(Tesar & Smolensky, 2004)

This form indicates the constraints making different stratum to specify the dominance relation with the next stratum instead of being ranked with regard to one another. "When C_1 and C_2 are in the same stratum, two marks $*C_1$ and $*C_2$ are equally weighted in the computation of Harmony" (Tesar & Smolensky, 2004). This brings about the issue of harmonic ordering with stratified hierarchies for the purposes of defining the candidates' relative Harmony, when all constraints in a single stratum are collapsed and treated as a single constraint. In this study, sonority constraint associated with lateral and flap were

collapsed and treated as constraint related to liquids. Hence, the re-ranking needs comparison of the lateral and flap sounds in terms of their sonority. Wiese (2001) regards the flap (/r/) as prosody. According to "him", "/r/" is the point on the sonority scale between laterals and glides where glides precede a vowel. Accordingly, the sonority hierarchy assumed for the evaluation of cluster acquisition in Oromo can be:

(25)

Vowels	>> Glides	>> [r]	>> [l]	>> Nasals	>> Obstruents
6	5	4	3	2	1

Here when children use the lateral sound as a replacement for the flap, there is a constraint violation pertaining to use of a liquid sound instead of an obstruent. In this case, the constraint must be re-ranked to identify their desire among the liquid sounds. Therefore, since Oromo speaking children prefer the least sonorant sound, laterals are more convenient than the tap/flap sound. Re-ranking the sonority of the two demotes the markedness and leads to a dominance of the faithfulness constraint (**Ident[$_F$]**>>*LO). The initial stratified hierarchy $\mathcal{H}_0$ consists of a single stratum containing dissimilar constraints.

(26)

$\mathcal{H} = \mathcal{H}_0$ = {*LO, Ident [$_F$]}

For the children realization, the first loser/winner pair is (b) < (a). Mark Cancellation is applied to the corresponding pair of mark lists, resulting in the mark-data pair shown in (27) below.

(27)

loser <winner		*Marks'(loser)*	*marks'(winner)*
(b) < (a)	[k'alʃi:] < [k'aʃʃi:]	~~*LO~~, **Ident[$_F$]**	*LO,~~Ident($_F$)~~

Now, when constraint demotion (CD) is applied, the highest-ranked (in $\mathcal{H}$) is the un-cancelled loser mark, which is **Ident[$_F$]**. The marks' (winner) are checked to see if they are dominated by **Ident[$_F$]**. The only winner mark is ***LO,** which is not so dominated. Demotion, as a result, calls for lowering *LO to the stratum immediately below **Ident [$_F$]**. Since no such stratum currently exists, it is created, triggering the following hierarchy.

(28)

$H = H_1 = \{Ident\ (_{F.}), *LO\}$

As a second developmental step, lateral sound outranks the flap sound just as readily have been re-ranked with respect to sonority feature.

(29)

Input: /k'arʃi:/	*LO	**Ident[$_F$]**	***LO**
☞ a.[k'alʃi:]	*		*!
b.[k'aʃʃi:]		*!	

This shows that children's output forms gradually developed to high sonority sounds like the alveolar flap in clustering. The candidates violated the markedness constraint based on feature selection attributed to the liquid first member. In all cases, highest sonority values were disfavoured by the majority of the children challenging SSP. providing correct segmental ordering and the sonority index corresponding to each phoneme:

(30)

A.	k'aʃʃi:	vs.	B.	k'arʃi:
	151155			153155

They mostly use sounds resembling in sonority index (as shown in (A)) rather than the ones with asymmetrical sonority value (B). Specifically, children acquiring Oromo as a first language tend to prefer clusters of sounds with the sonority index (1) or (2) at the initial stage as their acquisition begins from the two margins of the sonority index. The first word, for example, is composed of two categories of sounds depending on their sonority with the intention of harmonizing the sounds: the most (5) and the least sonorous (1) sounds.

Harmonization consequently led to complete assimilation causing the gemination favouring the least sonorant (an obstruent) instead of the middle sounds. As stated in the previous section, they acquired vowels and the voiceless stops very early followed by nasals. Therefore, they begin uttering the least sonorous, and then proceed to the peak and go back to the bottom of the sonority index where they departed alternating between 1 (2) and 5 sonority indexes. In every instance, they prefer the least sonority indexes 1 (2) after a peak which will increase to (3) after certain progress.

Relating to the locations in FIGURE 19, they prefer staying below the lower and above the upper horizontal lines (not between them). This preference of 1 (2) sonority scale can be reconsidered for the 3rd and 4th SI (especially for 4) as their grammar develops. For example, when the lateral sound is used as opposed to the flap the markedness constraint was violated and became demoted for faithfulness constraint dominates the initial markedness.

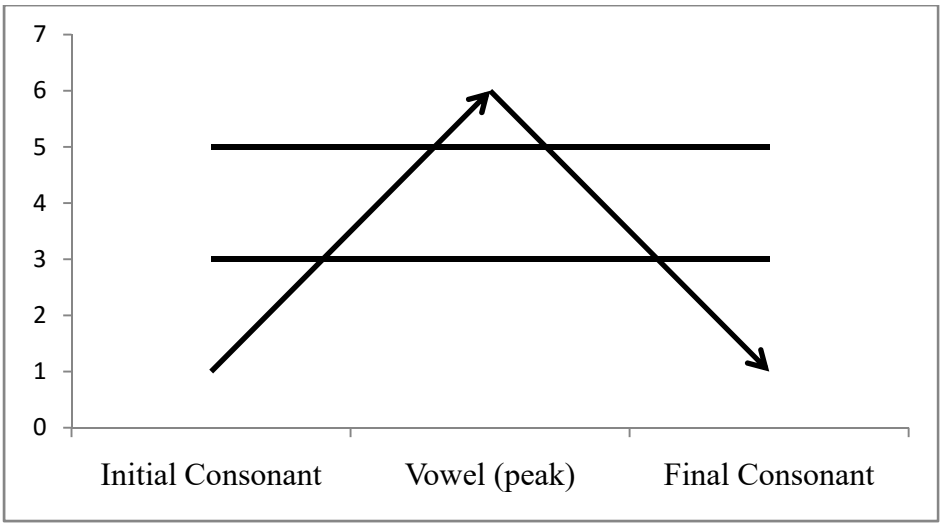


FIGURE 19: Children's preference for the sound's sonority

After re-ranking of the constraints, the lateral sound was favoured for its proximity to the flap sound. Indeed, in spite of its conflicting sequences of the principle, I assume that the sonority hierarchy is strictly ranked above faithfulness constraints in the initial grammar. On the other hand, clusters possessing liquids as C_1 and ejective/affricate as C_2 were acquired approximately at the end of four year and errors arising from such clusters are expected to disappear after five years. TABLE 22 generally gives you an idea about the age at which full acquisition of the cluster types is expected.

	Expected Age of Acquisition		
Cluster type	**3**	**4**	**5**
Nasal-Stop	x		
Liquid-Stop			x
Glide-Stop		x	
Liquid-Fricative			x
Nasal-Fricative			x
Liquid-Ejective			x
Nasal-Ejective			x
Stop-Stop	x		
Stop-Affricate		x	
Stop-Fricative		x	
Fricative-Stop		x	
Nasal-Nasal		x	
Liquid-Nasal			x

Table 22: Expected acquisition age of the cluster types

As can be seen from TABLE 22, while others could be completed before four years, cluster types possessing sonorants as the first member seem to be acquired after their age of four. With these clusters, distances between the sounds range from zero to three depending on the sounds' sonority value.

4.2.2.2. Summary

Oromo lets a small variety of word medial consonant clusters not exceeding two consonants. Most of these clusters hold Sonorant C_1 constituting prevalently nasals and liquids plus C_2 obstruent. Clusters formed with second member sonorants are infrequent since sonorants rarely occupy C_2. Nasals and glides were the C_1 sonorants smoothly produced with dissimilar sounds while liquids were frequently simplified. Three stages can be notable in the acquisition of Liquid-Obstruent clusters in Oromo: at the first

stage, the clusters are simplified to geminate obstruents; at the next stage (when C_1 is a flap sound), the C_1 is chiefly simplified to a lateral sonorant (acquiring more subtle contrasts) and finally, produced as Liquid-Obstruent clusters. Replacing the flap with an obstruent decreases the sonority. The relevant rankings are {MAX, *LO}>>FAITH (Ident [F]) for the replacement of the more sonorous consonant with the least sonorous in the cluster.

Children speaking Oromo generally master acquisition of the language's word medial clusters constituting nasal-stop, nasal-fricative, nasal-ejective, glide-stop, nasal-nasal and stop-fricative are acquired approximately at the age of three. Mis-articulations related to these cluster types are as well expected to disappear at the end of three years. Even if the children acquiring the language simplified the cluster of consonants, their simplification is not to a singleton. In essence, the children acquired almost all the cluster types at the end of five years although the acquisition of the cluster types carries different preferences.

Normally, clusters made up of liquid first member showed the greatest diversity in articulation accuracy. In such clusters, children begin with dominant markedness constraints and have the task of achieving the particular ranking of unmarkedness and faithfulness found in the language. Of the cluster types, the happenings of liquid as C_1 and the occurrences of ejectives/affricates as C_2 seem to be the most difficult clusters to utter accurately at first by Oromo speaking children. However, their utterance mainly resembles the adult target at the end of five years due to the elimination of the simplification strategies related to the clusters.

4.2.3. Syllable structure

In the analysis of syllables, two main approaches exist: phonetic and phonological. The former tries to characterize syllables in terms of articulatory or acoustic measures while the latter tries to categorize syllables considering the sound patterns of the languages. In this study, a phonological analysis of syllable structure was conducted to decide the participants' production capability of the syllable shapes. This was made regardless of the target consonants and vowels' correctness or apt realization of the target words. Further, a syllable structure was considered present in the syllable inventory of the age group, if twelve or more of the sixteen subjects produced the said structure at least twice per participant in the age group. Of the syllable shapes used in the language, the data entirely targeted the structures, where the frequency count was indicated in FIGURE 20.

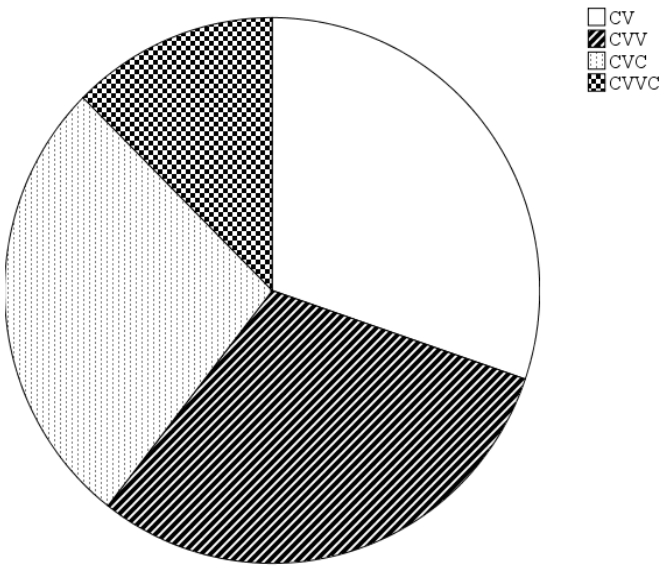


FIGURE 20: Frequency of the syllable shapes in the data

From the FIGURE it can be understood that open syllables (CV and CVV) were the most prevalent syllable shapes employed in the data (and possibly in the language) followed by the CVC syllable. Still, only 12.5% was tallied as CVVC from the entire syllable shapes of the targeted words. Combinations of the different syllables assessed within targeted words start from monosyllabic word (ʃan) 'five' possessing CVC syllable shape and goes further to bi-syllabic words such as CV.CV, ([ʔija]) 'eye',

CV.CVV, ([ɗaɗa:]) ‘butter’, CVC.CVV, [ʔaɗɗa:] ‘poison’ and multisyllabic words like CV.CVV.CVC.CV [wara:βessa] ‘hyena’(containing three open and one closed syllables).The majority of the children acquiring Oromo accordingly produced all the syllable shapes at/before the age of three.

These syllables were detected to be the most simple syllable shapes in Oromo and therefore the assumption was made that by age 3;0 children within the three groups would be able to produce them easily. Since monosyllabic words rarely occur in Oromo, all the children were able to produce words composed of more than one syllables correctly, which occur frequently in the language. It is likely that they heard many words with geminate consonants of two or more syllables from their surroundings and thus may start to produce these shapes early on. In terms of the syllable sequences in utterances of Oromo acquiring children, they are also capable of producing words consisting of up to four syllables. In general, participants of this study have the capacity to produce all the language’s syllable shapes including the closed ones in spite of variation in terms of accuracy owing to the absence of reduction as shown in TABLE 23.

No.	**Syllable type**	**Age Group**		
		1	2	3
1	CV	+	+	+
2	CVV	+	+	+
3	CVC	+	+	+
4	CVVC	+	+	+

Table 23: Acquisition of the syllable shapes across age groups

The children acquired these syllable shapes approximately at the age of three including the closed ones. Within the OT framework, the critical assumption is that an infant who acquires a language tries to produce the "unmarked" CV-syllable constantly whereas onset-less syllables or onset clusters or closed syllables are regarded as marked, but

whether this markedness constraint regularly plays the role at the initial stage of acquisition of every language is controversial (Fikkert, 2000; Fikkert, 2007). Concerning its composition, all the languages consonants can be in a coda position except the two glottal sounds and the palatal fricative.

Every syllable of the language has an onset consonant but optionally possesses a coda. As per the syllabification algorithm of the language, word medial consonant cluster divide between coda and onset. Since the acquisition of the clusters in Oromo greatly varies from other languages; it signifies that children may make a distinction among sounds to be put on coda position. Depending on sonority the least sonorous sounds were tolerated occupying the coda position excepting the glide sound. Coda is considered correctly produced as it is identical to the target at or more than 50% of the time. Given that early acquisition of gemination in the language, children prefer substitution of a certain sound with the other to create a geminate sound.

As have been indicated in the cluster acquisition, children frequently replaced liquids (the prevalently occupying coda position in clusters) into an obstruent. Furthermore, children may remove a coda consonant by deletion or de-gemination. Hereunder, the emergence of a type of codas by age and percentages was illustrated starting with the most prevalent coda consonant (liquids). In the data, 368 utterances of a child have these consonants in the adult target. The average correct production of a coda consonant was computed for three of the age groups and showed 229 of the total utterances with a standard deviation of (59.56) across the age groups. Accordingly, their correct production percentage of the coda was computed and reveals the following result.

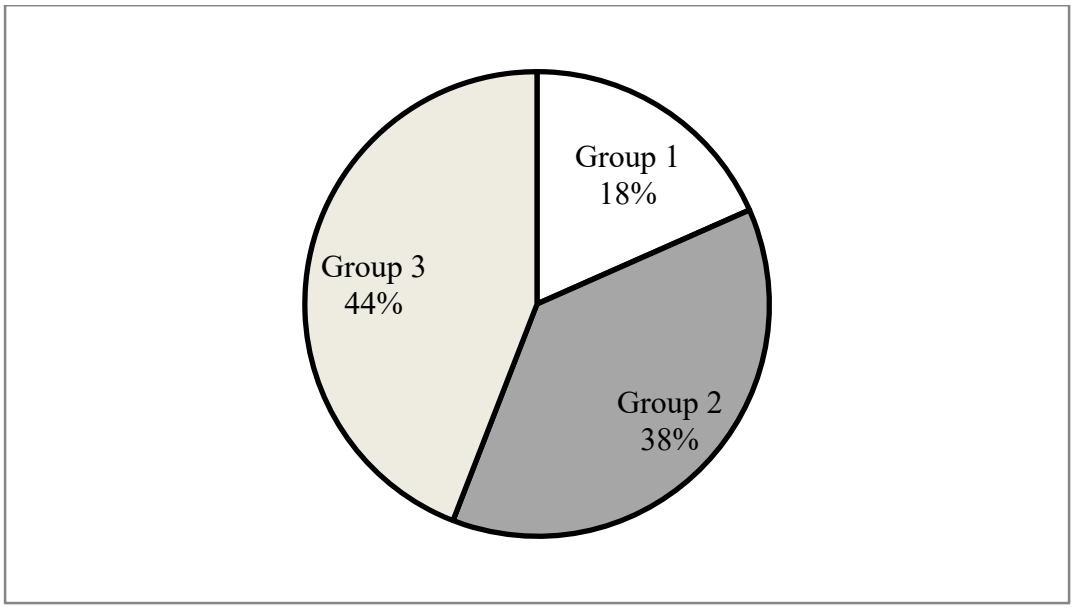


FIGURE 21: Percentage of a liquid coda correctness

This computation seems to be a bit crude, for replacement of a lateral sound with a flap is counted as correct. However, when the clusters were individual checked (scrutinizing the accuracy of the output in relation to its input form) the result reveals:

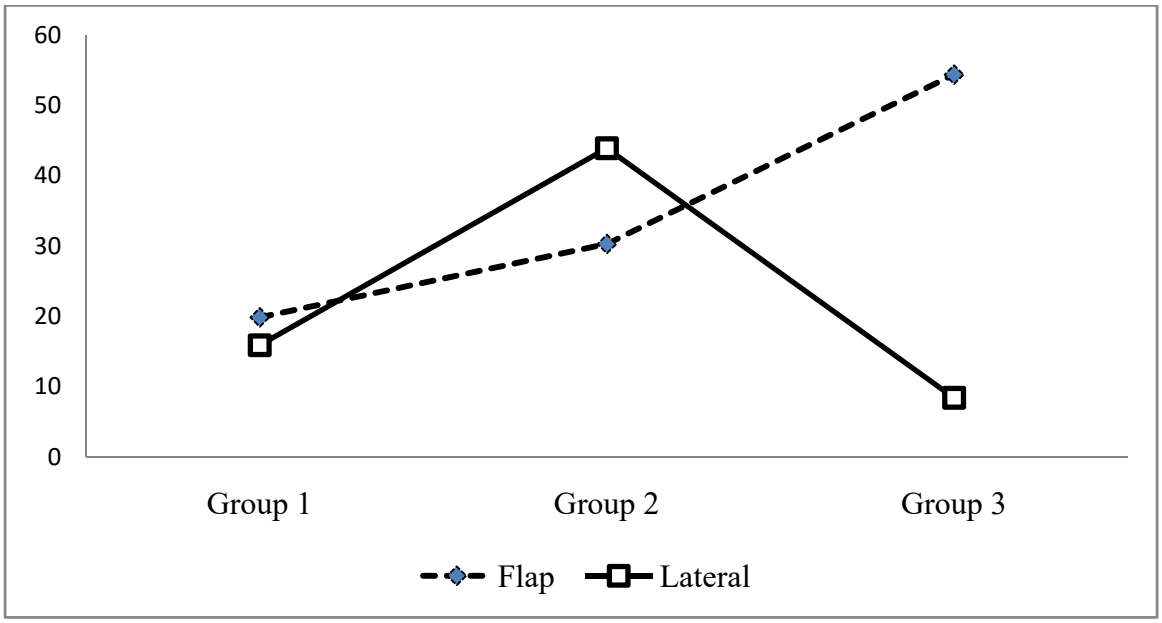


FIGURE 22: Percentage of flap Correctness in coda position

FIGURE 22 shows that participants in the second group mainly used lateral sound in a coda position more frequently than the flap sound. The other liquid sound, [r], was actually used as a coda across all the age groups with a diverse rate of recurrence. With group one and three, use of a flap sound is greater than the replacements made, which the remaining group prevalently employed.

As already mentioned repeatedly, liquids and nasals are the most widespread codas in the language. Therefore, FIGURE 23 revealed the result of this study by comparing the occurrences of the nasal sounds in a coda position. In the utterance of the children, 336 occurrences of the three nasal sounds of the language in a coda position were assessed for the calculation. In the computation, all the nasals results showed less than 50% of correctness for the entire participants as a consequence of various phonological processes.

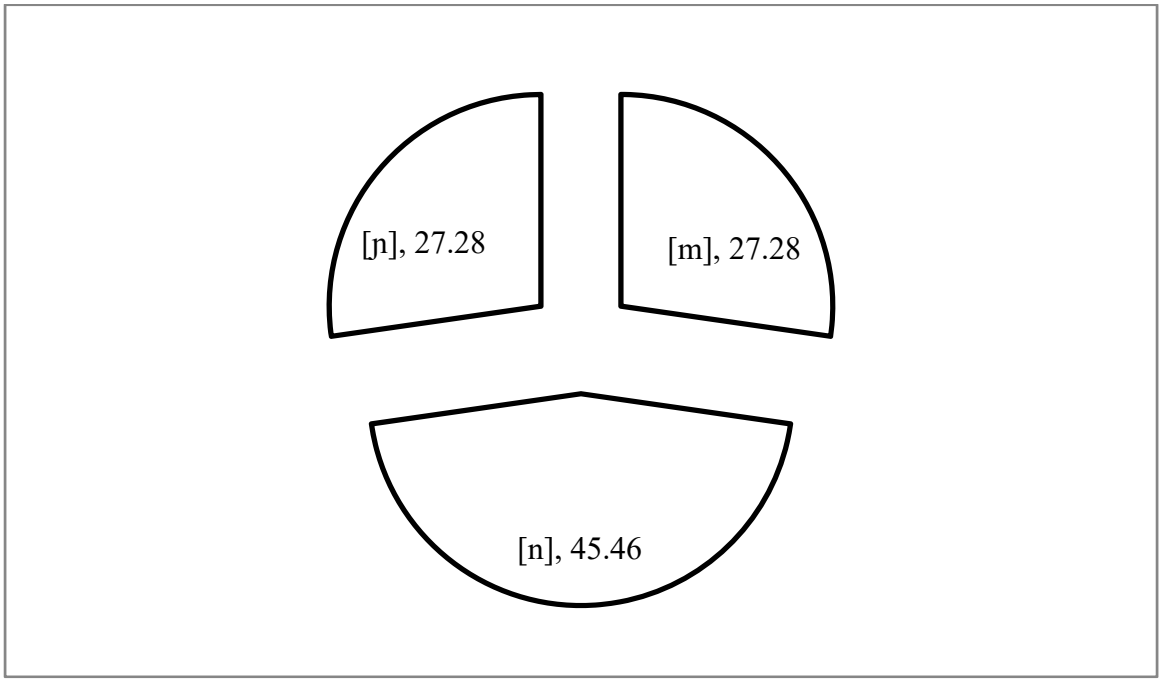


FIGURE 23: Percentage of nasal coda sounds production correctness

The FIGURE shows that the alveolar nasal occurs frequently as a coda. But the counting cannot result in the total coda appearance of the sounds owing to varied realizations. For instance, an alveolar nasal gets realized as a velar nasal when followed by a velar onset consonant. Apparently, the alveolar nasal as a coda tend to appear very early. On the other hand, even though palatal nasal does not make a cluster with any other sound and takes no final position in the language its happening was almost equivalent to the occurrence of labial nasal. The reason is children make the phonological process (termed as palatalization) that turns the alveolar nasal into a palatal nasal (§ phonological process).

4.2.4. Acquisition of Length

A greater duration while articulating both consonants and vowels in Oromo is the occasion for contrastive geminates and vowel length, respectively. The term geminate in phonology refers to a long or doubled consonant (Crystal, 2008) that contrasts phonemically with its shorter or singleton counterpart. Geminate consonants or long vowels are transcribed in three ways: (a) by doubling the phoneme; (b) with a single consonant/vowel followed by the IPA length mark, or (c) with two identical consonants separated with a syllable boundary marker. In this study, the geminates were transcribed as a sequence of two identical phonemes while vowel length was transcribed as a single vowel followed by the IPA length mark. Even if such contrasts are not very common among languages (Ladefoged, 1993), acquisition of vowel length and gemination resulting from varied duration are treated in this subsection as it is contrastive in the language.

In the data collected, distinctiveness was not tested using typical minimal pairs, to check the suitability of their productions in relation to the adult target using purposefully selected words. However, length was tasted for each consonant and vowel sounds where all the vowels can be contrastive based on length while some consonants are not.

Regarding vowels, the data was composed of the entire vowels' occurrences in the language; and thus their frequency count was presented in FIGURE 24.

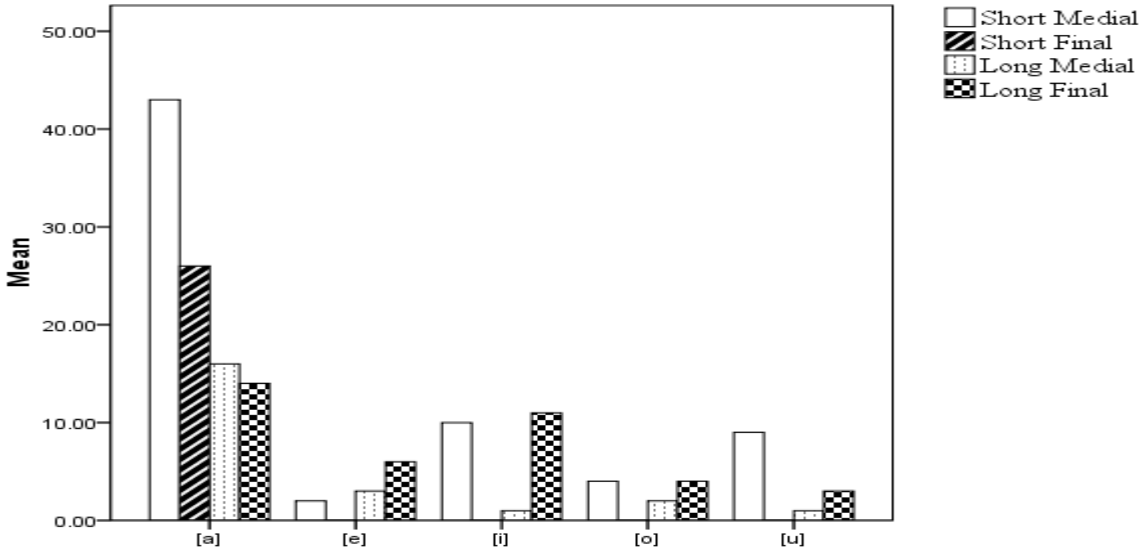


FIGURE 24: Vowels' frequency and distribution in the data

All the vowels are likely to occur frequently word medially. In both positions, [a] is the most prevalent sound in its either short or long occurrences followed by [i]. On the other hand, the two back vowels were relatively rare in both positions occurring as short and/or long. As can be seen from the syllable structure's acquisition, children can basically produce both short and long vowels even though acoustic analysis is indispensible to compare adult and child production. All the five short and long vowels of the language were produced in word medial and final positions by the three categories. Even though some inaccuracies were recorded in the first and second groups, the majority of the children contrastively used vowel length in their utterances.

The other characteristic associated with the length feature is gemination. Unlike vowel length which may take place in both word-medial and final positions, geminates occur in Oromo when a consonant sound is doubled only in a word medial position. Two types of geminates often occur in the language: the first type of geminate is part of the lexical root of the word, which is often lexically contrastive. For example, the Oromo minimal

pair /rako:/ ‘ritual’ and /rakko:/ ‘problem’. 24 words (29.63%) with geminates of this kind were included in the target data. The palatal nasal [ɲ] and affricate [ç] sounds have no singleton counterpart and merely occur as geminates. The second type results from simplification strategies arising from processes of assimilation that occurs when two identical phonemes are adjacent in two neighbouring syllables within a word or two adjacent words in connected speech. Clear examples from the speech of Oromo speaking children are illustrated as follows.

(31)

Cluster	**Gem. Sound**	**Gloss**
/dugda/	[dudda]	‘back’
/ʔurɟi:/	[ʔuɟɟi:]	‘star’
/harka/	[hakka]	‘hand’

In this attempt, dissimilar adjacent sounds became similar to form doubled consonants resulting in gemination. Oromo speaking children can identify consonant length at or before the age of three. Almost all the children produced correct gemination contrasts despite some mispronunciation. The mispronunciation is mainly de-gemination (removing one of the segment) when the words are mainly composed of more than two syllables. Five children (10.42%) from the first and second group occasionally de-geminated the actual geminates of the language. For example, some of them realized the word /k’erriffa:/ ‘Canine tooth’ as [kerifa:] removing coda consonants of the first and the second syllables. However, this tendency was not recorded in the speech of the children in the third age groups. This indicates that children’s acquisition of gemination completes at their age of five although they chiefly mastered at or before their age of three. Generally, the data show that vowel length and gemination or C-lengthening appears very early in Oromo.

4.2.5. Phonological Processes

The phonological process is a pattern of speech found in every typically developing child where s/he employs errors as a strategy to simplify their utterance (O'Grady & Cho, 2011). As children were cognitively and physically immature they cannot perfectly produce the intended input; as a result, they have a tendency to make their speech simple using diverse mechanisms. From the review of literature on child phonological development, it was observed that deletion, assimilation, and insertion are the major lists of phonological processes. Children acquiring Oromo as well utilize some of these strategies to make their speech simpler. The strategy has different types that we shall discuss in detail taking into account the speech of children acquiring Oromo.

4.2.5.1. Types of phonological process

Two major simplification strategies should be considered before dealing with their error pattern: structural simplification and systematic substitution. Assimilation, deletion and free variation are terms arising from structural simplification while stopping, fronting, backing, and gliding are terms of the systemic substitution in the speeches of children. These processes are analogous across languages (Hua & Dodd, 2000) which can generally be categorized into dialectal and developmental phonological processes.

Developmental error is deviation based on the child's age or cognitive maturity while dialectal is an error arising from the input of the child directly emanating from the dialect they are acquiring. Therefore, in the present study patterns of children's errors were sorted out into dialectal and developmental phonological processes. Compared to the dialectal ones major emphasis was given to the developmental phonological processes. As a result, the phonological process was considered present if it appeared two times in a child's single word sample. Following Dodd *et al*.'s (2003) criteria, the presence of an age-appropriate phonological process in each age group was defined

where more than 10% of the children in an age band used that process. In addition, occasional and rare patterns were defined, respectively occurring in at least 5% and in less than 5% of the target words attempted by two or more children in the age group. Phonological representations are of critical importance for models of child utterances in the framework of OT.

4.2.5.1.1. Structural simplification and systematic substitution

In child language phonology, simplification is "a set of mental operations that change or omit phonological units as the result of the natural limitations and capacities of human vocal production and perception" (Dodd, Holm, Hua, & Crosbie, 2003). It happens in Oromo speaking children's speech in the form of assimilation and deletion which is mainly dialectal in nature. Additionally, their speech can as well be characterized by a systematic substitution of sounds in different ways. They have a tendency to use this strategy either by means of changing the glottal feature of a sound so as to (de)glottalize or shifting the flap to lateral sound or changing the normal position of the sounds from back to front or vice versa. Accordingly, processes of (de)glottalization, de-gemination, fronting, backing, and lateralization were manifested in the speeches of the children assessed. For instance, it was observed that sometimes children may substitute glottal sound with their weaker equivalents as shown in the following example.

(32)

Input	**Realized**	**Gloss**
/t':fi:/	[ta:fi:]	'Ethiopian endemic cereal (its Amharic form is t'ef)'
/harʔa/	[harra]	'today'
/k'uba/	[k^{w}uβa]	'finger'
/k'otto:/	[k^{w}ott^{w}o:]	'axe'
/k'e:nsa/	[k^{y}e:nsa]	'nail'

Here, the ejective sounds /t'/, /k'/ and the glottal stop /ʔ/ were changed to [t], [k] and [r] losing their glottal feature. This change was not restricted to positions in a word and may come about initially or medially. Alternatively, non-glottal sound may turn out to a

glottal sound for simplification of both features (by assimilation) in clusters (e.g. /salp'a:/ [sapp'a:] 'Easy'). In such utterances, the non-glottal sound /l/ gets a complete substitution by a sound with a glottal feature [p'] that may also result in another systematic substitution termed as fronting (see patterns of Oromo Cluster acquisition).

(33)

Input	**Realized**	**Gloss**
/torba/	[tobba]	'seven'
/salp'a:/	[sapp'a:]	'easy'
/farda/	[fadda]	'horse'
/harma/	[hamma]	'breast'
/ʄilba/	[ʄibba]	'knee'
/silmi:/	[simmi:]	'tick'

With a similar pattern, a different developmental phonological process known as backing might also result from the systematic substitution of certain sounds such as the lateral sound.

(34)

Input	**Realized**	**Gloss**
/harka/	[hakka]	'hand'
/ʔilka:n/	[ʔikka:n]	'teeth'
/marga/	[magga]	'grass'
/k'arʃi:/	[k'aʃʃi:]	'money'

Secondly, systematic substitution may bring about an error pattern known as lateralization in Oromo when /r/ is realised as /l/ in any word position. Given that /r/ was shown to be one of the most challenging consonants to be acquired and was not included in the inventory of children in the first group, it was not surprising that some form of substitution, predominantly of /l/, happened in the speech of the children when approaching mastery of the sound.

(35)

Input	Realized	Gloss
/farda/	[falda]	‘horse’
/harka/	[halka]	‘hand’
/marga/	[malga]	‘grass’
/mark’a:/	[malk’a:]	‘porridge’
/k’arʃi:/	[k’alʃi:]	‘money’

In the second and third age groups, majority of the participants substituted /r/ with /l/. For example, /ʔafur/ ‘four’ was realized as [ʔaful] changing the flap sound /r/ to the lateral sound.

From OT’s perspectives, some constraints prevent particular phonological elements (e.g. flap) from being in pronunciations. In this instance, markedness constraint **Not ([+Flap])** dominates the faithfulness constraint (IDENT [F]) in Oromo, which can be defined as follows.

(36)

Not ([+ Flap]): Flap consonant ([r]) is not allowed.

Devoicing is a different simplification strategy that children mainly employ systematically while acquiring the phonology of languages. Similarly, Oromo speaking children employed devoicing as a basic simplification strategy mainly in clusters.

(37)

Input	Realized	Gloss
a./jilba/	[jilpa]	‘knee’
b./torba/	[t^{w}orpa	]‘seven’
c./ç’absu:/	[ç’aps^{w}u:]	‘breaking’
d./harka/	[hakka]	‘hand’[11]
e./silga/	[silka]	‘colostrum’

[11] Gemination also occurred as result of this process.

This strategy was frequent with the first group even though not missing in the other groups. This tendency continues with the second and third group, which shows the persistence of the process until their five years of age despite decrements in frequency. In the first two examples (a & b) children altered the voicing feature of the bilabial stop and realized the voiceless [p]. Devoicing of the labial stop to this non-typical sound of the language, in such instances mainly happens when it occurs as a second member in a cluster with the liquid sounds. Example (c) further reveals that the bilabial stop was as well devoiced to become alike with the alveolar fricative voiceless /s/. The last examples (d & e) demonstrate a change of the liquid /r/ and the voiced velar stop /g/ to [k]. From the perspective of OT, the devoicing circumstances can be defined as the ranking of ONSET (-Voice), dictating voiceless consonants in an Onset position, above the faithfulness IDENT[F] constraint, excepting (d) which favours CODA-COND. Furthermore, devoicing may happen at a word-final position to the alveolar nasal and some short vowel sounds as shown in TABLE 24.

Input	**Realized**	**Gloss**	**Input**	**Realized**	**Gloss**
/damma/	[dammạ̥]	‘honey’	/ʔija/	[ʔijạ̥]	‘eye’
/nama/	[namạ̥]	‘human’	/ʔa:nnan/	[ʔa:nnan̥]	‘milk’
/mana/	[manạ̥]	‘house’	/ɲa:ra/	[ɲa:ɾạ̥]	‘eyebrow’

Table 24: Devoiced realizations

In each of these examples, the final voiced sounds (both the vowel and the nasal alveolar sounds) got devoiced. Deviation process of this type is sometimes termed as word-final devoicing. Here it is worth noting that the final nasal often gets deleted by the majority of the first age group participants, but is devoiced by the second and third group perhaps while they try to manifest the sound in the position. Considering these forms, the constraints needed to arrive at the attested outputs are *VOICEDV# and IDENT[F] where *VOICEDV# is defined as:

(38)

*VOICEDV#: the voicing of low short vowels is banned at word-final positions.

In the speech of the children as well as in the grammar, voiceless short vowels never appear, so *VOICEDV# must be ranked high. It should, as a result, follow that IDENT [$_{VOICE}$] is low ranked since voiceless vowels on the surface are tolerated in their speech.

(39)

Input: /nama/	*VOICEDV#	IDENT[$_{VOICE}$]
☞ a. [namḁ]		*
b. [nama]	*!	

The tableau illustrates the crucial ranking in which Candidate (b) was eliminated as a consequence of the higher-ranked markedness constraint *VOICEDV# that bans final voiced short vowels. The winning candidates, meanwhile, violate the identity constraint IDENT [$_{VOICE}$], but since it is low ranked, the incurred violations are tolerated.

Structurally, assimilation is manipulation of sounds' features in the dialect to make adjacent sounds alike or identical. In such processes "a segment takes on features from a neighbouring segment" (Schane, 1973) for the easiness of production. The three age groups tend to employ different phonological processes characterized as assimilation and is also obvious to find analogous processes within the speeches of a child that are not employed in the adult target.

The most frequently occurring assimilations in the utterances of all the participants were palatalization, labialization/rounding, and nasalization. When compared to the acquisition of other languages, the number of assimilation errors made by Oromo speaking children seems to be very limited. Researchers often use different terms to describe these error patterns and the following section describes some of the evident phonological error patterns related to assimilation with Oromo speaking children.

Firstly, children may shift the articulation place of a certain sound approximately or totally to palatal resulting in a process of palatalization. Two types of palatalization manifested in the speech of Oromo speaking children: complete and partial. Complete palatalization occurs whereby a non-palatal sound completely gains a palatal place of articulation from its neighbouring palatal sound as shown below.

(40)

/le:nç'a/ [le:ɲç'a] 'lion'

/le:nji:/ [le:ɲji :] 'training'

In this example, the alveolar nasal completely changes its place of articulation to palatal to resemble the palatal sound /ç'/ and /j/. This process was undertaken by almost all the participants assessed in all the groups provided that it is chiefly dialectal. However, most children from the first age group changed the glottal stop into a palatal glide as in the case of [pa:jje:] 'many' for /ba:jʔe:/. This is a way of changing the glottal sound into palatal a process systematically referred to as fronting in different studies. As it is developmental, this is a frequently recorded process with the first and second groups. In addition, in the children's speech, partial palatalization was manifested when the front medial vowel /e/ follows a consonant. For example, many of the children assessed palatalized the velar ejective /k'/ into [$k^{y]}$ and as a result pronounced as [k^{y}e:nsa] 'nail'.

Theoretically, since any heterorganic cluster inputs should be overruled by Coda Condition (CODA-COND) in OT, the optimal analysis eliminates the place features of one of the consonants in the clusters that imply a removal of place features by any consonant, thereby violating IDENT [F]. See the following tableau.

(41)

Input: /le:ɲji:/	CODA-COND.	IDENT [F]
☞ a. [le:ɲji :]		*
b. [le:nji:]	*	

A tableau shows that markedness dominated the faithfulness constraint in resolving coda condition to bring about the process of complete palatalization. In addition, for simplification, they also changed the liquid /r/ completely by a palatal sounds [ʃ] and [j] as in /k'arʃi:/[k'aʃʃi:] 'money' and /ʔurji:/ [ʔujji:] 'Star' (see patterns of cluster acquisition in Oromo).

Rounding/labialization in Oromo speaking children's speech as well occurs whereby consonants share the rounding feature of their subsequent round vowels of the language; namely [o] and [u] as can be seen from (42).

(42)

Input	**Realized**	**Gloss**
/k'otto:/	[$k^{w}ott^{w}o$:]	'axe'
/k'uba/	[$k^{w}u\beta a$]	'finger'
/ç'absu:/	[ç'$aps^{w}u$:]	'breaking'

The following rule (43) is a simplified description of the process.

(43)

$$\begin{matrix} C \\ [\text{-round}] \end{matrix} \rightarrow [\text{+round}] \,/\, \underline{\quad} \begin{matrix} V \\ [\text{+round}] \end{matrix}$$

The process has a constraint symbolized as #**CV [+ round]**, which can be defined as (a consonant followed by a round vowel have to get a rounding feature). OT defines this process as the dominance of markedness constraint (#CV [+ round]) over the

faithfulness, IDENT[F] since every consonant preceding round/back vowel share the vowel's feature.

In the speech of Oromo speaking children, the other process is nasalization whereby non-nasal sounds turn out to be a nasal sound sharing a nasal feature of their neighbouring sound. Short vowels may as well be nasalized when a nasal sound was crossed out from the structure word finally as in (44).

(44)

Input	**Realized**	**Gloss**
/k'abna/	[k'amna]	'we have'
/biʃa:n/	[biʃã:]	'water'
/ʃan/	[ʃã:]	'five'

In the first example, the stop was changed to nasal retaining it place feature. For the other two examples, the nasality feature was spread to the vowels which OT describes as the dominance of markedness **#CV [+nasal]** (penultimate vowels followed by a nasal consonant get nasality) over the faithfulness, IDENT since every penultimate vowel followed by a nasal consonant shares feature of the consonant. The actual duration of the vowel with [ʃã:] 'five' was improved other than its nasalization.

Other than nasalization of the vowel, nasal consonants at the end of the last two words were deleted in their speech. In this case, the deleted consonant preceding vowel gets nasalized signifying omission of the nasal consonant. Both [biʃã:] and [ʃã] are candidates in standard OT that are always more faithful to the input requiring feature identity between the input and output for their vowels carrying nasality. The other case for deletion is de-gemination which sometimes happens when a geminate consonant lacks its length. The average percentages of omitted phonemes in both cases were calculated, respectively as 6.10%, 3.66% and 2.44% in the three stages. This shows that NOCODA

(Syllables have no coda) is a constraint ranked high in Oromo speaking children for the cases in point. The rankings can be demonstrated from the OT framework as in (45).

(45)

Input: /biʃa:n /	NOCODA	MAX	IDENT [F]
☞ a. [biʃã:]		*	*
b. [biʃa:n]	*!		
Input: /k'arriffa: /			
☞ a. [karifa:]		*	*
b. [karriffa:]	*!		*

Worth noting is final consonant deletion was suppressed before five years of age. Nonetheless, deletion of final alveolar nasal was more prevalent than deletion of other sound classes such as liquids.

In Oromo speaking children's speech, velarization as well occurs when the non-velar sound changes its place of articulation to velar. This phonological process generally takes place in the language when alveolar nasal sound /n/ comes immediately before the velar sounds. The same happened in the speech of the children regardless of their age group provided that the process is dialectal (see the first two examples). In this instance, it acquires the velar place of articulation from the adjacent velar sounds as shown in (36). The last three processes in (46) demonstrate developmental patterns manifested only in the speech of children.

(46)

Target	**Realization**	**Gloss**
/sa:nk'a:/	[sa:ŋk'a:]	'door
/sanga:/	[saŋga:]	'ox'
/ʔilka:n/	[ʔikka:n]	'teeth'
/marga/	[magga]	'grass'
/mark'a:/	[makk'a:]	'porridge'

In the example, a nasal sound /n/ changes its place feature to velar nasal /ŋ/ or voiceless velar /k/ by occurring before the language's velar consonants which can sometimes be termed as nasal place assimilation. In the framework of OT, Nasal Place assimilation is essentially captured with CODA-COND and IDENT [F], with domination in a specified order (CODA-COND >> IDENT [F]). See the tableau in (47).

(47)

Input: /sa:nk'a:/	CODA-COND.	IDENT[$_{VOICE}$]
☞ a. [sa:ŋk'a:]		*
b.[sa:nk'a:]	*	
☞ a. [ʔikka:n]		*!
b. /ʔilka:n/		

In the tableau, the candidate, [sa:ŋk'a:] satisfies high-ranking of CODA-COND, and thus is selected over the candidate [sa:nk'a:] which preserves an underlying place feature, IDENT (F). Furthermore, changing of the alveolar sound to a velar place of articulation occurs once more to fulfil the CODA-COND. For instance, some children pronounced /harka/ as [hakka] 'hand' turning out the alveolar into velar sound (cf. cluster acquisition with liquids).

Besides, spirantization happens to labial stop consonants positioned intervocalically to turn them out to fricatives. In the speech of Oromo speaking children, spirantization

arises when voiced bilabial stop /b/ is fricativized to /β/ while they occur between vowels or when followed by vowels word medially or to [f] when followed by fricatives in clustering as illustrated in example (48).

(48)

Target	**Realization**	**Gloss**
/k'uba/	[k^{w}uβa]	'finger'
/wara:bessa/	[wara:βessa]	'hyena'
/ʔabʃa:la/	[ʔafʃa:la]	'astute'
/ʔibsa:/	[ʔifsa:]	'light'

The tendency for the voiced stops to alternate with the fricative spirant, suggests that the grammar of Oromo disfavours a complete oral closure in combination with vocal fold vibration. Following this consideration, one can call on the markedness constraint *VDSTOP as the reason why spirants often emerge in the place of voiced stops in Oromo.

(49)

***VDSTOP:** Singleton voiced stops are prohibited intervocalically.

Comparing the two constraints the process calls on: *VDSTOP >> IDENT (F)

(50)

Input: / k'uba/	*VDSTOP	IDENT(F)
☞ a. [k^{w}uβa]		*
b. [k'uba]	*	

Candidate (a) was rejected by the non-dominated IDENT (F) constraint since the voiced stop lacks an output correspondent, but favours the markedness constraint that prohibits intervocalic singleton voiced stops. The dominant constraint for the other examples is a 'coda condition', which bars the stop disallowing voiced heterorganic codas.

Further, two independent phonemes of a language may alternate in specific contexts without any misrepresentation of the lexical item's meaning as in the case of Oromo initial glottal sounds. Regarding this Durand (1990) says "If two phones can be substituted for each other in the same environment without destroying the identity of the lexical item under consideration, they can be said to be free variants of the same phoneme." At the word-initial position, eleven children (68.75%) from the first group, nine children (56.25%) from the second group, and thirteen children (81.25%) from the third group repetitively used a glottal replacement of the sounds. Here are some of the examples.

(51)

Target	**Realization**	**Gloss**	**Target**	**Realization**	**Gloss**
/harka/	[ʔarka]	'hand'	/harʔe:/	[ʔarr̥a]	'today'
/harma/	[ʔarm̥a]	'breast'	/hoǰǰa:/	[ʔoǰǰa:]	'length'
/hinda :k'k'o:/	[ʔinda:k'k'o:]	'hen'	/haɗɗa:/	[ʔaɗɗa:]	'poisonous'

In this process only just the glottal stop replaces the glottal fricative; while the replacement of the glottal stop with the fricative in the identical position was not recorded. In fact, it is not the way users of the language employ the pattern and accordingly, children do not get a similar input to use the variation.

4.2.5.1.2. Developmental and dialectal phonological process

The number of developmental phonological processes used in Oromo seems to be very limited and its gradual decrease was noted from younger children to older children: the first group exhibited more phonological processes as opposed to the second and the third groups. This was what is anticipated given the studies that have focused on children acquiring other languages. In spite of the fact that all studies agree that the use of phonological processes decreases with age, there is variability found in terms of the type of phonological processes and the age of suppression of these processes. Since there are

no studies in Oromo and very limited information on phonological processes used in other Ethiopian languages, it was a bit difficult to draw conclusions with regards to the age of suppression of the processes observed in the present study. Further investigations should be carried out to examine the phonological processes in depth using a larger sample of children so it can be determined whether the phonological processes listed are typical and the 'idiosyncratic' processes are in fact unusual or are widely used in typical development.

To make a point based on the samples, dialectal phonological processes do not terminate in course of the children's development and accordingly progressed in four ways across the three age groups: increased, decreased, fluctuated or was stable. Dialectal phonological process usages, which increased across age groups, included a glottal replacement, nasalization, and rounding while palatalization and devoicing decreased. Majority of the developmental phonological process such as consonant devoicing, de-gemination, and (de)glotalization were ceased at the end of four years. However, processes of lateralization and palatalization (backing or fronting particularly related to the alveolar fricative) suppressed approximately at the end of five years.

The developmental phonological process used by these children was mainly substitution whereby one class of sounds is replaced by another. The substitution is somewhat systematic. Glottalization or de-glottalization and devoicing were employed as widely occurring error patterns within the speeches of the first and second participants. The participants chiefly devoiced both consonants and vowels in diverse positions. For example, the bilabial stop was among the commonly devoiced consonant in medial and/or initial positions. Similarly, some word-final consonants like the alveolar nasal and short low vowels turn out to voiceless.

De-glottalization was chiefly manifested with the velar and palatal ejectives for their mastery was relatively late; while glottalization was observed when alveolar and bilabial ejectives make C_2 in clustering with liquids. Lateralization and final consonant deletion

were as well among the commonly observed phonological processes counted as developmental. The counting of backing or fronting was mainly associated with the alveolar fricative depending on the children's preference for the dentalized or palatalized equivalent. The counted processes were generally summarized to illustrate the percentages of their occurrences (see Figure 25).

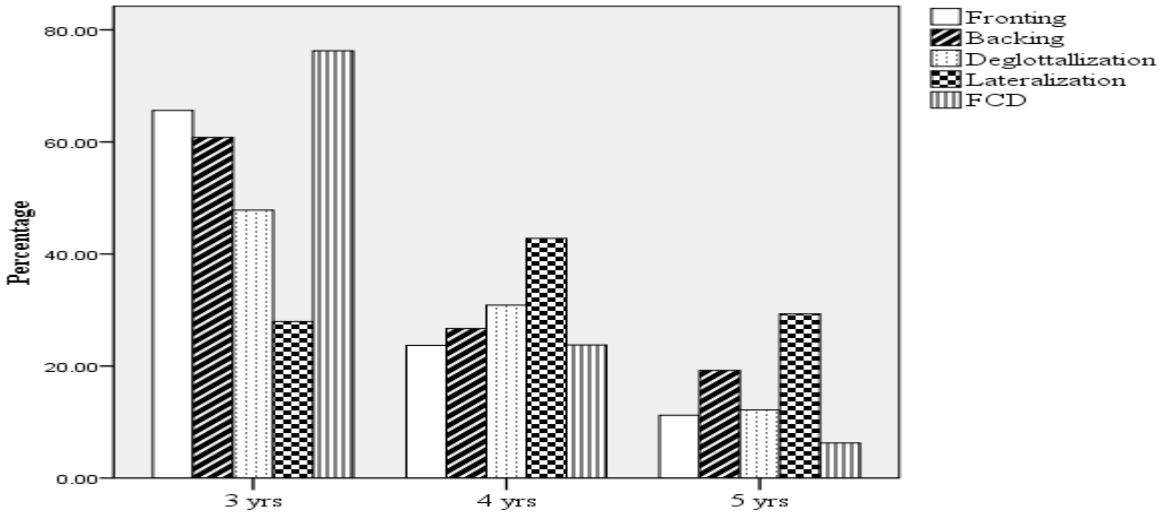


FIGURE 25: Mean percentage of the developmental phonological process

It is apparent that the simplification processes used by the children in this sample are not specific to any group. The speeches of each group possess all the developmental processes indicated even with a decrement in frequency. This suggests that for Oromo speaking children, these processes may be ones that continue even after the age of 6;0. The mostly employed phonological process was final consonant deletion followed by fronting and de-glottalization for the first age group. However, lateralization was uncommon and was seen to be the least phonological process employed at the age of three. In the speech of the second group participants, lateralization was the highest process. Similarly, lateralization was still at the top of the processes for the third group followed by backing although final consonant deletion (FCD) was notably reduced. At five years, the average mean percentage of the children's speech shows less than 20% excepting backing and lateralization.

4.2.5.2. Summary

In this section, a detailed analysis of syllable shapes, phonological process, and acquisition of segment length was made. From the four syllables of Oromo, the children acquired the entire syllable shapes approximately at the age of three although their realization of the closed syllables varies from the adult target. They mostly replace sounds considered as marked with the apparently unmarked ones. For example, they frequently replaced the widely occupying coda position in clusters with an obstruent sound. The other supra-segmental feature, discussed in this section was length. The finding, as a result, indicated that Oromo speaking children can recognize C/V-length appears very early in Oromo. Children in all groups use various phonological processes either signifying their development or arising from the dialect's input. From the above discussions, it can be summarized that 7 phonological processes (normally regarded as developmental) were highly eminent in the speech of children acquiring Oromo. It is commonly viewed that patterns of errors are divided into two: segmental and prosodic patterns.

In this study, patterns described is merely the segmental one: changes that happen by the substitution of one sound for another with the alternative sound-reflecting changes in place of articulation, manner of articulation, or some other change in the way a sound is produced in standard adult production. Almost all developmental error patterns decreased with an increase in age of the children despite occasional fluctuations in the frequency of error occurrences. On the other hand, dialectal phonological processes increased as their age increased. Within both categories, two strategies can be employed: structural simplification and systematic substitution. Although structural simplification and systematic substitutions take place in the speeches of Oromo speaking children, many of these phonological processes arising from structural simplification listed in this study were the ones seen in the speech of the adults. Therefore, it can be chiefly characterized as dialectal since it has a high percentage of occurrences in the adult

utterances, but error patterns considered in this study as systematic substitution are typically within the speeches of children indicating their progress.

CHAPTER FIVE
DISCUSSION

5.1. Introduction

This dissertation aimed to explore the phonological development of Oromo speaking children using an assessment of single-word speech samples obtained from 48 children aged between 3;0 and 5;11 years. In order to describe the phoneme inventory, frequent syllable shapes within the age group, phonological processes, and PCC/PVC of Oromo speaking children by means of a cross-sectional design, independent and relational analyses were conducted. In this chapter, each of the study objectives will be individually discussed to associate the findings from the study with the literature reviewed. It is not possible to compare the findings of this study with other studies on the language since there are no previous acquisition works that have investigated the same population focusing on Oromo phonological development, as to my knowledge. However, the findings are discussed with reference to other languages, developmental universals, and psycholinguistic frameworks.

Generally, the type of speech production patterns noted in the children considered here appear to be diversified where most of the patterns are age-appropriate and cross-linguistically universal though others are language-specific. For instance, acquisition of most of the phonemes before the age of three is universally accepted even if the acquisition of the language specific sound (the implosive) occurred very early, contrary to what is anticipated. In addition, patterns of fronting, backing, devoicing, FCD, and lateralization were similarly regarded as universal patterns marked in the language. However, the pattern of making the process eminent was perceived to be language-specific. For example, two levels of adaptation strategies were used for the simplification of clusters as clusters of consonants were not reduced to a singleton, excepting the de-gemination. These are complete assimilation at first and then reducing the degree of complete assimilation to designate the existence of a different feature in the input. Here, the following section gives details of the study reports against the reports of literature on different languages.

5.2. Phonemic inventory

Phonemic acquisition patterns were analysed for the 24 consonants and five vowels of the language. The results of the age of acquisition of the phonemes, accordingly, indicated both universal and language-specific features. Primarily, Oromo speaking children tend to acquire some sounds the way expected in other languages as suggested in the universality hypothesis. The hypothesis proposed that some widespread sounds in all languages are acquired earlier than other sounds, while infrequent sounds would be acquired later (Jakobson, 1968). Vowels were as well said to be acquired before consonants whereby nasals and plosives precede fricatives, affricates, ejectives and implosives.

Accordingly, Oromo speaking children very early acquired vowels of the language (before three years) which is supported by the studies on Swahili and isiXhosa speaking children. As Gangji, Pascoe, & Smouse (2014) stated Swahili vowels are acquired as early as 3 years of age. IsiXhosa speaking children also acquired all the language's vowels by 3;0 years (Maphlala, Pascoe, & Smouse, 2014). Due to this (early acquisition) most normative studies on child language acquisition did not assess patterns of vowel acquisition (Dodd, Holm, Hua, & Crosbie, 2003). Similarly, in this study assessing the children's patterns of vowel acquisition was not attempted for its achievement before the categorized age range. The acquisition of consonants as well marked differences within the age groups. Even acquisition of the consonants was relatively incomplete at their four years of age. Different studies on different languages asserted that /m/ as well as /b/ sounds were among the first consonants to emerge in the very beginning (Fikkert, 2000). Even if the accurate realization of the bilabial stop was attested late in Oromo, the bilabial nasal of Oromo speaking children similarly appeared early in their utterances.

The bilabial stop gets realized phonetically in the language and was very often distorted mainly before the age of four. Generally, sounds like nasals, stops (except /b/ and /d/), implosive, and glides were acquired relatively early. In the same way, findings of most

previous studies on various languages supported this finding. For example, in English-speaking children, these sounds (apart from the implosive sound, which English lacks in its inventory) are consistently acquired before other sounds (Dodd, Holm, Hua, & Crosbie, 2003). Parts of the ejectives (2 of 4) were also among the early emerging sounds for the first age groups while the alveolar fricative is the sound mastered by the last group. On the acquisition of the alveolar fricative, it differs from the data reported for other languages even though this resembles the findings of Gangji, Pascoe, & Smouse (2014). For instance, Hua & Dodd (2000) reported the sound's acquisition to be as early as 2;6 years, but others thought to have a long-range of typical emergence (Smit, Hand, Bernthal, Freilinger, & Bird, 1990). In isiXhosa speaking children, the sound was produced approximately at 4 years (Maphlala, Pascoe, & Smouse, 2014). In French-speaking children, it was also indicated that the sound was not mastered before 53 months (Trudeau, Macleod, Sutton, & Thordardottir, 2011). In Oromo, the sound was frequently distorted and replaced by either a dental or a palatal equivalent.

When ejectives are patterned for their features, they resembled in terms of voicing and manner features but differ in their place feature. That means children's patterns of sound acquisition might be predisposed by the sound's place of articulation where palatal fricative precede the alveolar one. In fact, the acquisition of palatal sounds was observed to be early, but the accuracy of the palatal and velar ejectives was relatively late. Ejectives produced in these places were functionally realized as their weaker members. Additionally, as onset-less syllables are prohibited in Oromo the early acquisition of the glottal stop /ʔ/ in Oromo is expected since it is often used in syllable onset; this explains why it was found to be among the most frequently produced stops. It was additionally found that children speaking Oromo acquire some sounds (like /ç, l, j/) earlier than others, which English speakers acquire later. Similar to English and Igbo, Oromo speaking children acquired the flap, /r/, latterly. In Igbo, it was one of the last phonemes to be acquired (Nwokah, 1986). Although this study indicates four years, others show

late acquisition after five years. For example, Swahili speaking children acquired the phoneme only by 5;11 years (Gangji, Pascoe, & Smouse, 2014).

Normally, the study showed an establishment of a full phonological system at the end of five years. Even before four years, children acquired the majority of the language's sounds (82.766%) while precision increased with an increment of the child's age that supported findings of the entire studies reviewed on the phonological development of typically developing children. Additionally, the present study found more production correctness of females indicating an influence of sex on children's accuracy of sound production. Even if, the suggestion of sex differences in speech sound development remains contentious (Dodd, Holm, Hua, & Crosbie, 2003), there are a few studies supporting this suggestion while reported different findings. For example, Dodd, Holm, Hua, & Crosbie (2003) found the influence of sex on speech accuracy where girls performed better than boys on all of the speech accuracy measures. Poole (1934) cited in Dodd, Holm, Hua, & Crosbie (2003) found a significant sex difference with females showing better phonological accuracy than males. Further, similar to the work of Dodd, Holm, Hua, & Crosbie (2003) younger Oromo speaking children manifested higher individual variability.

In general, despite resemblances, a number of differences in the acquisition were observed between Oromo and other languages. The divergences may be due to variations in the phonetic or phonological details of the consonants arising from the phonetic and phonological differences of the languages. Normally, developmental and cognitive factors can be figured out for these nonconformities. Firstly, it is believed that children begin producing relatively unmarked phonological elements, which turn out to be more marked throughout their development. Yet, markedness seems to come from the quintessence of different constraints. For instance, it has been traditionally associated with a typology of the sounds in the acquisition, i.e.; sounds that are common in languages of the world are said to be unmarked and acquired early (Fikkert, 2000). On

the other hand, others argue the relationship basis of perception and production (note the fis-phenomenon).

With the view of typology for phonological markedness, the implosive sound and ejectives were supposed to be among marked sounds owing to their infrequency in languages of the world and thus must be acquired late. As to these points, for example, the interdental and alveopalatal fricative sounds of the English language (which are uncommon in many languages) were seen to be acquired late (Dodd, Holm, Hua, & Crosbie, 2003). Nevertheless, the first group completely achieved the implosive and some of the ejective sounds implying a different view for the markedness constraint in an acquisition. Similar to this study, other studies revealed a similar finding. For example, from the 16 click sound inventories of the isiXhosa language, children completely acquired at least 10 of them including "some of the more complex clicks" at or before 3;6 years (Maphlala, Pascoe, & Smouse, 2014) and invalidates the assumption of the relatively late in acquisition of less widespread sounds.

Secondly, the sonority nature of the sound in a certain structure may bring about the constraints for markedness. In view of this, the sonority hierarchy proposes that more sonorous consonants are sounds expected to emerge early in an acquisition. For example, voiced stops are anticipated to emerge before the voiceless ones. However, Oromo speaking children produce voiceless stops earlier than voiced ones. For example, they produced /t/ before /d/ and /p/ before /b/. Remarkably, they tend to replace the voiced bilabial with its voiceless complement for the ease of production by violating the sonority sequencing principle (SSP) even if the sound does not exist in the language. Likewise, Arabic children normally learn voiceless stops sooner than voiced ones (Amayreh & Dyson, 1998). Universality hypothesis, however, proposed the incidence of consonantal opposition at first between nasal and oral stops as in mama-papa (Jakobson, 1968) which indicates an early emergence of nasals and voiceless sounds. This holds true for Oromo speaking children even though it violates the SSP.

5.3. PCC and PVC

This study used the two quantitative measures, PCC and PVC, to document the speech sound accuracy of Oromo speaking children to give an indication of accurateness within this sample when producing consonants and vowels. Both quantitative measures were calculated and averaged for the participants in the age group to compare the findings of the study with researches done in other languages. Evidently, the performance of the older group was more accurate than the younger group on both speech sound accuracy measures. This development pattern is generally universal and almost all previous studies comply with this study.

Speech sound accuracy of the Oromo speaking children differed greatly when Oromo dialectal features were not considered for they mainly employ phonological processes used in the dialect. In addition, some developmental phonological processes may apply to their speech that decreases the accuracy measure of the children. As a result, the PCC of children acquiring Oromo (as indicated in this study) is comparatively less than results obtained in the other studies at the same age since any deviation from the target sound is considered as inaccurate realization. Yet, the results of the present study revealed that their speech sound accuracy was increased across age groups.

The sounds' accuracy was significantly higher for the older age groups and decreases downwards. For example, the mean percentage of PCC values of the children acquiring Oromo for the three group participants were, respectively 93.21%, 97.50%, and 98.74%. As for Percentage Consonants Correct (PCC) scores, the PCC reported for English-speaking children were a bit greater for younger children than the statistics from this study (Dodd, Holm, Hua, & Crosbie, 2003), but the methodological difference may give a good reason for the differences. Unlike this study, their study was a huge cross-sectional study with a large sample size. Actually, a gradual increase in PCC was evident as expected on the account of more accurate performance for the older group

than the younger group's accuracy measures, which indicates phonological development of the children speaking Oromo. This progression pattern was observed in almost all the studies reviewed.

As to PVC, it was high (over 90%) for children ageing three years and there were no substantial increments in production accuracy. Dodd *et al*. (2003) reported a similar finding for British English and Cantonese speaking children. For Cantonese speaking children, for example, Dodd *et al.* (1995) reported 98.8% and 100%, for ages 2;0 and 5;11 on average PVC, respectively. Even if the performance of the older group was more accurate than the younger group on both speech sound accuracy measures, the results of PCC and PVC for Oromo speaking children indicated a considerable difference between the children in all groups. Similarly, PVC was generally observed higher than PCC in English speaking children. For Swahili speaking children, on the other hand, it indicated slight differences. This study, as a result, indicates that in all groups PCC is typically less than PVC for children acquiring Oromo.

5.4. Consonant cluster

Consonant cluster is a characteristic of many of the world's language; at least 39% of the languages were seen to have an initial cluster (McLeod, Doorn, & Reed, 2001). That means more than 1/3rd of the world's languages has consonant cluster in an onset position. Such clusters in any language can be produced at the different stage by children acquiring the language, but the majority of the children can produce at approximately two years (McLeod, Doorn, & Reed, 2001). Acquisition of consonant clusters has been frequently studied in typical and atypical language development. The researches indicated natural phonological constraints within every grammar of the human language in cluster acquisition, which makes the process a bit gradual and quite long in duration. In the early stages, language systems generally desire simpler, unmarked forms more than complex, marked forms. Therefore, children apply different cluster simplification strategies (in favour of simpler structure) at the stages where their

grammar does not permit clusters. Accordingly, the most common strategy of consonant cluster acquisition is reduction; where only one of the target consonants is produced (Zamuner, Gerken, & Hammond, 2004; O'Grady & Cho, 2011; Wyllie-Smith, Mcleod, & Ball, 2006). OT characterizes this strategy as the ranking of the markedness constraint *COMPLEX, which does not allow more than one segment, over the faithfulness constraint MAX, which rules out elimination of segments from the input structure (Boersma & Levelt, 2003). This is not the only way children simplify clusters in the course of their development for simplifications can be universal or language-specific.

Analysis of the data gathered signposts a peculiar strategy of cluster acquisition in languages. Most (if not all) previous researches on phonological acquisition suggested reduction as a strategy of simplification for every typically developing child (Dodd, Holm, Hua, & Crosbie, 2003; Hua, 2000; Gangji, Pascoe, & Smouse, 2014; Maphlala, Pascoe, & Smouse, 2014) for the children frequently produce consonant clusters as singletons. Alternatively, the reduction was not absolutely observed in the speeches of Oromo speaking children (regardless of de-gemination). They rather simplified in a different manner creating a process of adaptation by switching the apparently difficult sound with a simpler sound rather than omitting the sound. For instance, they tend to replace sonorants with obstruents preferring the least sonorous consonants after a vowel.

Essentially, they disfavoured liquids above all the sounds and mainly changed to an obstruent C_2 chiefly undertaking complete assimilation. Assessment of the behaviour of the consonants' sonority suggested that acquisition of liquid as C_1 desires replacement with the least sonorous sound at the early stage. This violates faithfulness constraint strictly ranking the sonority hierarchy above faithfulness. The distance expected between some of the clusters certainly results in a negative sonority and does not respect the sonority sequencing principle (SSP). Unlike this, considering members on coda or onset, clusters whose components are close in the sonority scale are more marked than clusters whose members are far apart.

So, clusters with greater sonority distance are easier to acquire than those with less distance (Brown T. , 2012). For instance, children typically acquire consonant clusters that consist of stop + liquid elements before they master fricative + liquid clusters (McLeod, Doorn, & Reed, 2001), a pattern of cluster type that Oromo transposes. In essence, the distances between the clusters are the same and must follow a similar pattern of acquisition. Generally, within any given language, a minimal allowable distance is tolerable within the clusters (Brown T. , 2012). However, the lateral sound seems to have a superior preference when compared to the flap since the majority of the participants approaching its mastery substituted the flap with the lateral sound which supports the findings on Swahili (Gangji, Pascoe, & Smouse, 2014). Swahili speaking children frequently used the process of lateralization for they frequently substituted the lateral in place of the flap sound (Gangji, Pascoe, & Smouse, 2014).

Cluster reduction does not continue generally after 4 years of age for languages such as English and Swahili (Dodd, Holm, Hua, & Crosbie, 2003; Gangji, Pascoe, & Smouse, 2014) while misarticulating clusters mostly terminated after four years in Oromo. Similar to the preferences manifested in the speeches of Oromo speaking children, some language-specific patterns were observed in reduction. This is closely linked to the idea that some sound patterns are more typical compared to others (McCarthy & Prince, 1994). Older children in Oromo generally produced more correct productions than younger children, and there was no sex effect.

The principles of sonority may provide a theoretical basis for explaining patterns of preference evident in children's speech. In English, the pattern included a variety of different realization rules (Dodd, Holm, Hua, & Crosbie, 2003) in its reverse order. Further, the reductions cannot be easily characterized as omission either by the position of the consonant or by preferential retention for certain manners or places of consonantal articulation (Ohala, 1997; San, 2010). In the same way, preferences of sounds by Oromo

speaking children can be characterized based on relative sonority. Children replaced the least sonorous sounds for the higher sonority sound. In addition, replacement of a sound was guided by position in Oromo whereby the first member was frequently replaced by the second.

5.5. Segment length and syllable structure

Jakobson postulated a universal order of syllable acquisition positing the first developing syllable structures in languages to be CV followed by its reduplicate form (Jakobson, 1968). However, the pattern of development in Oromo syllable structures was not checked given that the participants have mastered all the shapes before three years. Studies on different language like English, for instance, indicated that word initial and final bi-syllabic CV, VC, and CVC shapes were expected, by the age of two, which will increase to three syllable words by the age of four. Besides, English speaking children should have acquired all of the syllable structures by the age of six including multisyllabic words. Unlike English speakers, Oromo speaking children appear to be using longer strings of syllables before their age of three. However, a literature search has produced no studies to make a comparison on the age of development of the language syllable structures.

As per this study, they can produce multisyllabic words approximately at the age of three. The reason is that Oromo appears to obey more of the natural rules for preferred syllable structures than English does. For example, Oromo syllable structures are simpler lacking either coda or possessing utmost one; and the language has no complex clusters in onset and coda positions while English has both closed syllables as well as complex coda and onset clusters. Similar findings are reported for Swahili isiXhosa speaking children (Gangji, Pascoe, & Smouse, 2014; Maphlala, Pascoe, & Smouse, 2014). Their finding as well suggested that children acquiring both languages master simple syllable structure by 3;0 years while the development of complex and multisyllabic words continues even after 5;11 years.

Regarding segment length, it is uncommon in the languages of the world and its acquisition patterns were not extensively studied. Of the rare languages, Finnish and Japanese are said to have phonologically contrastive lengths for both vowels and consonants. However, the age at which children acquire these contrasts varied across these languages depending on some grounds. From the cross-linguistic comparison of the languages, Finnish children seem to begin distinguishing singleton versus geminate in production very early at approximately two years, while Japanese children do not reliably distinguish around the end of one year (Kunnari, Nakai, & Vihman, 2001). Apparent reasons suggested by the researchers were input frequency and degree of distinctiveness of the contrast in adult speech. In this study, nonetheless, it is difficult to analyze children's acquisition patterns of such contrasts, because of its completion before the age category although de-gemination seldom occurred in the speech of some first and second group children. Sounds de-geminated seem to be geminate sounds recurring within more than two-syllable words. The other language that uses a geminate consonant is Arabic where all its consonants can occur as geminate.

5.6. Phonological processes

Results of the present study on commonly occurring phonological processes are in agreement with some of the studies done on other languages. Even though languages differ in their use of phonological processes, Oromo speaking children use developmental systematic substitutions and structural simplifications. Structural simplification was made only when the final consonant (alveolar nasal) was deleted. The process persisted even at the age of 5 years because deletions of the sound maintained the nasality feature on the preceding vowel. As their age progress, the phonological process declines since the acquisition occurs. From the systematic substitution lateralization and devoicing were the main error patterns observed. Some phonological processes described for other languages such as English (Dodd, Holm, Hua, & Crosbie, 2003), Putonghua (Hua & Dodd, 2000), Swahili (Gangji, Pascoe, & Smouse, 2014), and

isiXhosa (Maphlala, Pascoe, & Smouse, 2014) are similar to those found in this study. Some of the phonological processes were rare while others seem to be frequent. For example, fronting and backing have been frequently observed in the speech of children learning English (Dodd, Holm, Hua, & Crosbie, 2003), Arabic (Amayreh & Dyson, 1998), and in Oromo but rarely observed in Putonghua speaking children. The pattern was used by only 16% of Putonghua-speaking children although backing was the second most frequent pattern existed in the speech of the children (Hua, 2002). As expected, all the developmental phonological processes were significantly noticed in the speech of the youngest group and consistently decreased across age groups.

Yet, of the commonly described phonological processes such as reduction and initial consonant deletion were not found. For example, in English two of the most frequently produced phonological processes were cluster reduction and final consonant deletion. From these processes, there was no cluster reduction but occasional deletion of the final consonant was observed in Oromo. For isiXhosa speaking children de-affrication, de-aspiration, de-nasalization, gliding of liquids and stopping were among the prevalently used substitution processes (Maphlala, Pascoe, & Smouse, 2014), but not occurred in the speech of Oromo children. Furthermore, similar to Swahili speaking children, since /r/ was found to be one of the most difficult sounds to utter at first and was acquired relatively late, lateralization was the most prevalent phonological process persisted across age groups by substitution of a lateral sound for the flap sound. This process is sometimes termed as preference substitution. Lateralization, however, was not a common process across languages like English.

Another frequently used phonological process arising from preference substitution in this study was devoicing, turning out a voiced sound into voiceless (e.g. [torpa] for /torba/ ‘seven’). It was found that the children of the first two groups substituted chiefly the voiceless with the voiced counterpart. The other substitution pattern observed was

fronting or backing the alveolar fricative. In Swahili, this pattern was observed only as fronting when the sound was dentalized, which is exceptional in English.

CHAPTER SIX

6. CONCLUSION AND FUTURE DIRECTION

6.1. Conclusion

The main focus of this study was to examine the phonological development of typically developing Oromo speaking children between the ages of 3;0 and 5;11. This was done by focusing on the inventory of sounds used, patterns of cluster acquisition, syllable shapes and phonological processes employed in the speech of the children at different age ranges. Thus, it was observed that all the participants produced the majority of the consonant sounds and all the vowels at their age of three. The participants were also able to produce correctly glottal stops, nasals and other voiceless stops irrespective of some phonological processes.

More than 75% of the participants in the last two groups (four and five years), acquired the entire palatals and velars except the ejective sounds /ç'/ and /k'/. The data also showed that vowels were as well among the early acquired sounds. Secondly, since Oromo allows a small variety of word medial consonant clusters, the majority of the clusters acquisition was investigated. From the sonority perspective, Oromo make clusters with sonorant C_1 possessing either nasals or liquids and C_2 obstruents. Provided that Oromo lacks onset and coda clusters, acquisition of the clusters types in a medial position was seen to be easier for the participants. The children acquired almost all the cluster types at the end of five years although the acquisition of the cluster affiliates carries different preferences. In all cases, they simplified clusters of consonants in favour of some features and replace one of the cluster members with the other although their simplification was not to a singleton coming up from deletion. The participants easily produced nasals and glides with dissimilar sounds while liquids frequently trigger a kind of certain simplification. Three stages were distinguished in their simplification. At first, the clusters are made simpler to a geminate obstruent using complete assimilation in favour of the least sonorous sound. Secondly, they increase the sonority value to a lateral sonorant and finally produce an accurate cluster.

As a rule, the happenings of liquid as C_1 and the occurrences of ejectives/affricates as C_2 appear to be the most intricate types at first to utter accurately by Oromo speaking children, which may resemble the adult target at the end of five years. Thirdly, the children participated in this study acquired all the syllable shapes of the language at/before three years. Compared to the children in the younger groups, older children were able to use longer and complex syllable structures and employ fewer phonological processes in their speech. The various phonological processes either signify their development or happen in the dialect as an input. The phonological processes either decreased/increased/stayed stable with an increase in age of the children despite occasional fluctuations in the frequency of occurrences.

Generally, they employed two strategies of simplification/ phonological processes: structural simplification and systematic substitution. Phonological processes categorized simply as developmental were expected chiefly to be suppressed at the end of five years. Even though deletion in consonant clusters was not attested, gemination seems to be acquired very early. However, children may occasionally remove a coda consonant in gemination for some reasons grounded in the OT (CODACOND.).

6.3. Future direction

There is a need for further studies on the phonological acquisition of Oromo speaking children, as limitations of this study would open up many research questions. For example, the present study indicates that speech starts developing before three years of age and continues developing after five years. Therefore, to more completely assess the mastery of speech sound production and developmental decline, testing of children should begin at younger ages and end at older ages. In order to get more detailed information about typical phonological development in such evaluations, a larger sample is as well suggested to be used in the language. In addition, child-directed speech should be collected to better understand the nature of the speech children hear, and how this influences their own speech. Furthermore, in the data collection gestures and facial expressions of the children accompanying their speeches should be reviewed by using spectrographic analysis or video recordings.

Additionally, to complement the normative data in the cross-sectional study reported in the present study, a longitudinal study was supposed to be carried out on children speaking the language as it is useful in documenting individual dissimilarities and age related individual progress (Hua, 2002). Finally, to better understand the acquisition patterns of Oromo speaking children, an in-depth acoustic analysis should be done to accurately describe the acquisition pattern of the language's vowel length and consonant gemination.

References

Abebayehu, M. M., & Demeke, L. (2017). Aspects of Phonological Acquisition in Children Speaking Sidaamu Afoo. *Journal of Child Language Acquisition and Development – JCLAD, 5*(4), 208-218.

Abera, N. (1988). Long Vowels in Oromo. Addis Ababa: Unpublished MA Thesis: Addis Ababa University.

Abraham, T. N., Huang, D., & Liu, X. (2014, July). Challenges of Diacritical Marker or Hudhaa Character in Tokenization of Oromo Text. *Journal of Software, 9*(7), 1818-1826.

Adams, M. J. (1990). *Beginning to read: Thinking and learning about print.* Cambridge: MIT Press.

Allwright, D., & Bailey, K. (1991). *Focus on the Language Classroom: an introductio to classroom research for language teachers.* Cambridge: Cambridge university press.

Amayreh, M. M., & Dyson, A. T. (1998). The Acquisition Of Arabic Consonant. *Journal of Speech, Language & Hearing Research*, 642-653.

Anderson, R., & Smith, B. (1987). Phonological development of two-year-old monolingual Puerto Rican Spanish-speaking children. *Journal of Child Language*, 57-78.

Andrew, W. (1982). *Review of Processing communication Education.* Cambridge: Cambridge University press.

Ayoun, D. (2005). *Parameter Setting in Language Acquisition.* New York: Continuum.

Barlow, J. A., & Gierut, J. A. (1999). Optimality Theory in Phonological Acquisition. *Journal of Speech, Language, and Hearing Research, 42*, 1482–1498.

Behrens, H. (Ed.). (2008). *Corpora in Language Acquisition Research: History, methods, perspectives.* Amsterdam / Philadelphia: John Benjamins Publishing Compan.

Beller, S. (2008). *Fostering language acquisition in daycare settings: What does the research tell us? Working Paper No. 49.* The Hague, The Netherlands: Bernard van Leer Foundation.

Benyam, A. (1988). The Phonology of Rayya Oromo. Addis Ababa: Unpublished B.A. Thesis: Addis Ababa University.

Birjandi, P., & Salmani-Nodoushan, M. A. (2005). *An Introduction to Phonetics.* Tehran, Iran: Zabankadeh Publications.

Bleile, K. M., & Tomblin, J. B. (1991). Regressions in the Phonological Development of Two Children. *Journal of Psycholinguistic Research, 20*(6), 483-499.

Boersma, P., & Levelt, C. (2003, November 23). Optimality Theory and phonological acquisition. Leiden.

Bogdashina, O. (2005). *Communication Issues in Autism and Asperger Syndrome: Do we speak the same language?* London and Philadelphia: Jessica Kingsley Publishers.

Bot, K. d., Lowie, W., & Verspoor, M. (2005). *Second Language Acquisition: An advanced resource book.* London and New York: Routledge.

Bot, K. D., Lowie, W., & Verspoor, M. (2007). Dynamic Systems Theory approach to second language acquisition. *Bilingualism: Language and Cognition* , 7-21.

Brown, H. D. (2007). *Principles of Language Learning and Teaching* (Fifth ed.). White Plains: Pearson Education, Inc.

Brown, J., & Yule, G. (1983). *Teaching the spoken language.* Cambridge: Cambridge University Press.

Brown, T. (2012). The Role of Syllable Structure in the Acquisition of American English by Three Native Amharic Speakers. *Linguistic Portfolios, 1*(6), 1-18.

Bruner, J. (1983). *Child's Talk: Learning to use Language.* New York: Norton.

Bussmann, H. (1996). *Routledge Dictionary of Language and Linguistics.* (G. Trauth, & K. Kazzazi, Trans.) London and New York: Routledge.

Carr, P. (2008). *A Glossary of Phonology.* Edinburgh: Edinburgh University Press Ltd.

Chomsky, N. (1986). *Knowledge of Language.* New York: Praeger.

Chomsky, N. (1999). On the nature, use, and acquisition of language. (W. C. Bhatia, Ed.) *Handbook of Child Language Acquisition*, 33–54.

Chomsky, N. (2000). *New Horizons in the Study of Language and Mind.* Cambridge: Cambridge University Press.

Clark, A. S. (2001). *Unsupervised Language Acquisition: Theory and Practice.* Sussex: University of Sussex.

Clements, G. N. (1988). The role of the sonority cycle in core syllabification. *Working Papers of the Cornell Phonetics Laboratory*, 1-68.

Cook, G. (2003). *Applied Linguistics.* Oxford: Oxford Universty Press.

Crystal, D. (1997). *The Encyclopedia of Language and Linguistics.* Cambridge: Cambridge University Press.

Crystal, D. (2008). *A Dictionary of Linguistics and Phonetics 6th Edition.* Oxford: Blackwell publishing.

Dejene, G. (2010). Kamisee Oromo Phonology. Addis Ababa: Unpublished M.A. Thesis: Addis Ababa University.

Demuth, K. (1996). Stages in the acquisition of prosodic structure. In E. Clark (Ed.), *Proceedings of the 27th Child Language Research Forum.* (pp. pp. 39-48.). CSLI: Stanford University.

Demuth, K. (1997). Variation in acquisition: An optimal approach. In S. Davis (Ed.), *Optimality Viewpoints* (pp. 77-88). Bloomington: Indiana University Linguistics Club.

Demuth, K. (2001). Prosodic Constraints on Morphological Development. In J. Weissenborn, & B. Hohle (Eds.), *Approaches to bootstrapping* (Vol. II, pp. 3-22). Amsterdam/Philadelphia: John Benjamins B.V.

Demuth, K. (2007). Sesotho Speech Acquisition. *The International Guide to Speech Acquisition*, 528-538.

Demuth, K. (2011). The acquisition of phonology. In J. Goldsmith, J. Riggle, & A. C. Yu (Eds.), *The Handbook of Phonological Theory* (Second Edition ed., pp. 571-595). Blackwell Publishing.

Demuth, K., & Johnson, M. (2003). Truncation to Subminimal Words in Early French. *Canadian Journal of Linguistics*, 211-241.

Dereje, T. G. (2010, April 14). The Implementation of a Multilingual Education Policy in Ethiopia: The Case of Afaan Oromoo in Primary Schools of Oromia Regional State. Jyväskylä, Finland: Unpublished PhD dissertation: University of Jyväskylä .

Devardhi, J., & Dejene, G. (2013). Assimilation in Oromo Phonology. *Language in India, 13*(10), 331-358. Retrieved August 17, 2015, from http://s3.amazonaws.com/academia.edu.documents/36422423/Assimilation_in_Oromo.pdf?AWSAccessKeyId=AKIAJ56TQJRTWSMTNPEA&Expires=1439802622&Signature=kJdSd4iPEdwH07DHLk%2FU34x9MsE%3D

Diessel, H. (2004). *The acquisition of Complex sentences.* Cambridge: Cambridge University Press.

Dinnsen, D. A., McGarrity, L. W., O'Connor, K. M., & Swanson, K. A. (2000). On the Role of Sympathy in Acquisition. *Language Acquisition*, 321–361.

Dodd, B. (1995). *Diagnosis and Treatment of Children With Speech Disorders.* San Diego: Singular Publishing.

Dodd, B. e. (1995). The acquisition of phonology by Cantonese-speaking children. *Journal of Child Language,*, 473-495.

Dodd, B., Holm, A., Hua, Z., & Crosbie, S. (2003). Phonological Development:a normative study of British English-speaking children. *Clinical Linguistics and Phonetics, 17*(8), 617-643.

Durand, J. (1990). *Generative and Nonlinear Phonology.* London and New York: Longman.

Edwards, J., & Beckman, M. E. (2008). Methodological questions in studying consonant Acquisition. *Clinical Linguistics & Phonetics*, 937-956.

Eriksson, C. C. (2014). *Children's Vocabulary Development: The role of parental input, vocabulary composition and early communicative skills.* Stockholm: Department of Special Education, Stockholm University.

Ertmer, D. J., & Goffman, L. A. (2011). Speech Production Accuracy and Variability in Young Cochlear Implant Recipients: Comparisons with Typically Developing Age-peers. *J Speech Lang Hear Res.*, 177–189.

Feda, N. (2015). Classification of Oromo Dialects: A Computational Approach. *International Journal of Computational Linguistics (IJCL), 6*(1), 1-10. Retrieved August 17, 2015, from http://www.cscjournals.org/manuscript/Journals/IJCL/volume6/Issue1/IJCL-65.pdf

Fikadu, B. K. (2014). Dissimilation in Oromo Phonology. *International Journal of Innovative research and Development (IJIRD), 3*(13), 187-196.

Fikkert, P. (2000). Acquisition of Phonology. In L. Cheng, & R. Sybesma (Eds.), *The first Glot International state of the article book: the Latest in Linguisitics* (pp. 221-250). Newyork: Mouton de Gruyter. Retrieved December 2014

Fikkert, P. (2007). Acquiring phonology. In P. d. Lacy, *The Cambridge Handbook of Phonology* (pp. 537-554). Cambridge: Cambridge University Press.

Fikkert, P., & Levelt, C. (2004). *How does place fall into place? The lexicon and emergent constraints in the developing phonological grammar.* Leiden: Manuscript, Radboud University of Nijmegen and Leiden University.

Fromkin, V., Krashen, S., Curtiss, S., Rigler, D., & Rigler, M. (1974). The Development of Language in Genie: a Case of Language Acquisition beyond the "Critical Period". *Brain and Language*, 81-107.

Gangji, N., Pascoe, M., & Smouse, M. (2014). Swahili speech development: preliminary normative data from typically developing pre-school children in Tanzania. *International Journal of Language and Communication Disorder*, 1-14.

Gardin, E., Henriksson, M., & Wikstedt, a. E. (2014). Consonant inventory of Swedish speaking 24-month-olds: A cross-sectional study. *FONETIK* (pp. 123-126). Stockholm: Stockholm University.

Gardner, H., Pascoe, M., & Stackhouse, &. J. (2006). Intervention for a child with persisting speech and literacy difficulties: A psycholinguistic approach. *Advances in Speech-Language Pathology*, 231 – 244.

Gass, S. M., & Selinker, L. (2008). *Second Language Aquisition: An introductory course* (Third Edition ed.). New York and London: Routledge.

Gierut, J. A., & Morrisette, M. L. (2005). The Clinical Significance of Optimality Theory for Phonological Disorders. *Top Lang Disorders, Vol. 25, No. 3*, 266–280.

Gierut, J. A., Morrisette, M. L., & Champion, A. H. (1999). Lexical constraints in phonological acquisition. *Journal of Child Language, 26*, 261-294.

Gordon, M. K. (2006). *Syllable Weight: Phonetics, Phonology, Typology.* New York & London: Taylor & Francis Group, LLC.

Gragg, G. (1976). Oromo of Wollega. *The Non-Semitic Language of Ethiopia*, 166-195.

Grierut, J. A., Morrisette, M. L., & Champion, A. H. (1999). Lexical constraints in phonological acquisition. *Journal of Child Language, 26*, 261-294.

Guasti, M. T. (2002). *Language Aquisition: the growth of grammar.* Massachusetts: The MIT Press.

Gxilishe, S. (2004). The Acquisition of Clicks by Xhosa Speaking Children. *Per Linguam*, 1-12.

Habte, B. (2003). Analysis of Tone in Oromo. Addis Ababa: Unpublished M.A. thesis: Addis Ababa University.

Hawine, A. (2007, July). The Structure of Nominal Clauses in Afan Oromo: A minimalist Approach. Addis Ababa: Unpublished MA Thesis: Addis Ababa University.

Hicham, G., Abdallah, Y., & Mostapha, B. (2012). Introduction of the weight edition errors in the Levenshtein distance. *International Journal of Advanced Research in Artificial Intelligence, 1*(5), 30-32.

Hinskens, F., Hout, R. v., & Wetzeis, W. L. (1997). Balancing Data and Theory in the Study of Phonological Variation and Change. In F. Hinskens, R. V. Hout, & W.

L. Wetzels (Eds.), *Variation, Change and Phonological Theory* (pp. 1-34). Amsterdam/Philadelphia: John Benjamins B.V.

Hochmann, J.-R., Benavides-Varela, S., Nespor, M., & Mehler, J. (2011). Consonants and vowels: different roles in early language acquisition. *Developmental Science*, 1445–1458.

Hua, Z. (2000). *Phonological development and disorder of Putonghua (Modern Standard Chinese)-speaking children. PhD thesis, University of Newcastle upon Tyne, UK.* Newcastle: University of Newcastle upon Tyne.

Hua, Z. (2002). *Phonological development in specific contexts: studies of Chinese-speaking children.* Great Britain: Cromwell Press Ltd.

Hua, Z., & Dodd, B. (2000). The phonological acquisition of Putonghua (Modern Standard Chinese). *Journal of Child Language*(27), 3-42.

Hurford, J. R. (1991). The evolution of the critical period for language acquisition. *Cognition*, 159-201.

Ingram, D. (1989). *First Language Acquisition: Method, Description, and Explanation.* Cambridge: Cambridge University Press.

Ingram, D. (1989). *Phonological Disability in Children* (Second ed.). London, Jersey City: Whurr Publishers.

Jakobson, R. (1968). *Child language, Aphasia and Phonological Universals.* The Hague: Mouton.

Kager, R. (2004). *Optimality Theory.* Cambridge: Cambridge University Press.

Kager, R., Pater, J., & Zonneveld, W. (2004). Introduction: constraints in phonological Aquisition. In R. Kager, J. Pater, & W. Zonneveld (Eds.), *Constraints in Phonological Acquisition* (pp. 1-53). Cambridge: Cambridge University Press.

Kaur, R., & Rao, T. A. (2015). Descriptive Analyses of Phonological Development in Typically Developing Hindi-Speaking Children. *Language in India*, 235-255.

Kebede, H. (2005). The Varieties of Oromo. (G. A. Demeke, Ed.) *Ethiopian Languages Research Center Working papers*, 134-149.

Kebede, H. J. (1994). Baate (Wello) Oromo Phonology: Palatalization of Alveo-dental Consonants and Related Issues. Addis Ababa: Unpublished MA thesis: Addis Ababa University.

Kormos, J. (2006). *Speech Production and Second Language Acquisition.* Mahwah, New Jersey: Lawrence Erlbaum Associates, Inc.

Kovács, A., & Mehler, J. (2009). Flexible learning of multiple speech structures in bilingual infants. *Science*, 611-612.

Krashen, S. D. (1981). *Second Language Acquisition and Second Language Learning.* California: Pergamon Press Inc.

Krashen, S. D. (1989). *Laguage Acquisition and Language Education: Extensions and applications.* New York: Prentice Hall International.

Kunnari, S., Nakai, S., & Vihman, M. M. (2001). Cross-Linguisitic Evidence for Acquisitionof Geminates. *Psychology of Language and Communication, 5*(2), 13-24.

Lacy, P. d. (2007). Themes in phonology. In P. d. Lacy (Ed.), *The Cambridge Handbook of phonology* (pp. 5-30). Cambridge: Cambridge University Press.

Ladefoged, P. (1993). *A course in Phonetics (third edition).* Orlando: Harcourt Brace College Publishers.

Lebeaux, D. (2000). *Language acquisition and the form of the grammar.* Amsterdam/Philadelphia : John Benjamins B.V.

Lee, S., & Cho, M.-H. (2002). Sound replacement in the acquisition of English consonant clusters: a constraint-based approach. *Studies in Phonetics, Phonology and Morphology*, 255-271.

Levelt, C. C., Schiller, N. O., & Levelt, W. J. (1999). A Developmental Grammar for Syllable Structure in the Production of Child Language. *Brain and Language, 68*, 291-299.

Levelt, C. C., Schiller, N. O., & Levelt, W. J. (2000). The Acquisition of Syllable Types. *Language Acquisition, 8*(3), 237-264.

Lloret, M.-R. (1997). Oromo Phonology. In A. S. Kaye (Ed.), *Phonologies of Asia and Africa (Including the Caucasus)* (pp. 493-519). Winona Lake, Indiana: Eisenbrauns.

Lodge, K. (2009). *A Critical Introduction to Phonetics.* New York: Continuum International Publishing Group.

Lust, B. C. (2006). *Child Language: Acquisition and Growth.* Cambridge: Cambridge University Press.

Macken, M. A. (1996). Phonological Acquisition. In J. A. Glodsmith (Ed.), *The Handbook of Phonological Theory.* Blackwell Publishing, Blackwell Reference Online. 31 December 2007. Retrieved from http://www.blackwellreference.com/subscriber/tocnode?id=g9780631201267_chunk_g978063120126724

Malmeer, E., & Assadi, N. (2013). Language Production and Comprehension: The Effect of Pre-school Aged Siblings on Toddlers Language Development. *Theory and Practice in Language Studies*, 1226-1231.

Maphlala, Z., Pascoe, M., & Smouse, M. R. (2014, March). Phonological development of first language isiXhosa-speaking children aged 3;0- 6;0 years: a descriptive cross-sectional study. *Clinical Linguistics & Phonetics, 28*(3), 176–194.

Maxwell, D. L., & Satake, E. (2006). *Research and statistical methods in communication sciences & disorders. (first ed.).* Boston : Thomson Delmar Learning.

McCarthy, J. J. (2002). *A Thematic Guide to Optimality Theory.* Cambridge: Cambridge University Press.

McCarthy, J. J. (2007). What is Optimality Theory? *Linguistics Department Faculty Publication Series.* Paper 93: http://scholarworks.umass.edu/linguist_faculty_pubs/93. Retrieved December 29, 2014

McCarthy, J. J. (2008). *Doing Optimality Theory Applying Theory to Data.* Oxford, UK: Blackwell publishing.

McCarthy, J., & Prince, A. (1994). The emergence of the unmarked: Optimality in prosodic morphology. *Norteastern Linguistic Society* , 333–379.

McLeod, S., Doorn, J. v., & Reed, V. A. (2001). Normal Acquisition of Consonant Clusters . *American Journal of Speech-Language Pathology* , 99-110.

Mekuria, B. (1995). Onesimos Nasib's Pioneering Contributions to Oromo Writing. *Nordic Journal of African Studies, 4*(1), 36-59.

Melaku, D. (1980). *Some Aspects of Oromo Phonology.* Manhattan, Kansas: Kansas State University.

Mewis, C. G. (1997). Swahili Loan-words in Oromo. *APP, 51*, 157-164.

Montrul, S. A. (2004). *The Acquisition of Spanish: Morphosyntactic development in monolingual and bilingual L1 acquisition and adult L2 acquisition.* Amsterdam/Philadelphia: John Benjamins Publishing Company.

Moskowitz, A. I. (1970). *The Acquisition of Phonology.* California University, Language and Behavior Research Lab. Berkeley: California University.

Musa, M. (1983). The Morphophonemics of Oromo. Addis Ababa: Unpublished B.A. Thesis: Addis Ababa University.

Nathan, G. S. (2008). *Phonology: A cognitive grammar introduction.* Amsterdam: John Benjamins Publishing Company.

Nelson, K. (1981). Individual Differences in Language Development: Implications for Development and Language. *Developmental Psychology*, 170-187.

Nwokah, E. E. (1986). Consonantal Substitution Patterns in Igbo Phonological Acquisition. *Language and Speech*, 159-176.

O'Grady, W., & Cho, S. W. (2011). *First Language Acquisition.* Montessori: Maria Montessori.

Ohala, D. K. (1997). *Cluster reduction and constraints in acquisition.* Arizona: The University of Arizona.

Peperkamp, S. (2003). Phonological Acquisition: Recent Attainments and New Challenges. *Language and speech*, 87-113.

Prévost, P. (2009). *The Acquisition of French.* Philadelphia: John Benjamins Publishing Company.

Prince, A., & Smolensky, P. (2004). Optimality Theory: Constraint Interaction in Generative Grammar. In J. J. McCarthy (Ed.), *Optimality Theory in Phonology: A Reader* (pp. 3-71). Padstow, Cornwall: Blackwell Publishing Ltd.

Robinson, P., & Ellis, N. C. (Eds.). (2008). *Handbook of Cognitive Linguistics and Second Language Acquisition.* New York and London: Routledge.

Rowe, M. L. (2012). A Longitudinal Investigation of the Role of Quantity and Quality of Child-Directed Speech in Vocabulary Development. *Child Development*, 1–13.

Saaristo-Helin, K. (2011). *Phonological Mean Length of Utterance as an Indicator of Typical and Impaired Phonological Development in Children Acquiring Finnish.* Helsinki: University of Helsinki .

San, P. H. (2010, May). The phonological development of Malaysian English Speaking Chinese children: A normative study. Christchurch, New Zealand: University of Canterbury.

Sander, E. K. (1972). When Are Speech Sounds Learned? *Journal of Speech & Hearing Disorders*, 55-63.

Schane, S. A. (1973). *Generative Phonology.* Englewood Cliffs, New Jersy: Prentice-hall, Inc.

Shriberg, L. D., & Kwiatkowski, J. (1982). Phonological Disorders III: A Procedure for Assessing Severity of Involvement. *Journal of Speech & Hearing Disorders*, 256-270.

Smit, A. B. (1993). Phonological error distributions in the Iowa-Nebraska articulation norms project - Word-initial consonant clusters. *Journal of Speech and Hearing Research* , 931-947.

Smit, A. B., Hand, L., Bernthal, J. E., Freilinger, J. J., & Bird, A. (1990). The Iowa Articulation Norms Project and It's Nebraska Replication. *Journal of Speech & Hearing Disorders*, 779-798.

Smolensky, P., & Prince, A. (1993). Optimality Theory: constraint interaction in generative grammar. University of Rutgers & University of Colorado .

Stemberger, J. P., & Bernhardt, B. H. (1997). Optimality Theory. *The new Phonologies*, 211-245.

Strömbergsson, S. (2014). *The /k/s, the /t/s, and the in-betweens: Novel approaches to examining the perceptual consequences of misarticulated speech.* Stockholm, Sweden: KTH School of Computer Science and Communication.

Syrika, A., Nicolaidis, K., Edwards, J., & Beckman, M. E. (2011). Acquisition of initial /s/-stop and stop-/s/ sequences in Greek . *Lang Speech*, 361–386.

Tavakoli, H. (2012). *A Dictionary of Language Acquisition: A Comprehensive Overview of Key Terms in First and Second Language Acquisition.* Tehran, Iran: RAHNAMA PRESS.

Temesgen, N. (1993). Word Formation in Oromo. Addis Ababa: Unpublished MA Thesis: Addis Ababa University.

Tesar, B., & Smolensky, P. (2004). Learnability in Optimality Theory. In J. J. McCarthy (Ed.), *Optimality Theory in Phonology: A Reader* (pp. 118-140). Malde: Blackwell Publishing Ltd.

Tilahun, N. (2014). Homorganic Nasal Assimilation in Arsi-Bale Afan Oromo: A Non-Linear Phonology. *Humanities and Social Sciences, 3*(4), 240-248.

Tomasello, M. (2005). *Constructing a Language: a usage-based theory of language acquisition.* Harvard: Harvard University Press.

Toohey, E. N. (2010). Phonological Development in Hearing Children of Deaf Parents. *Honors Scholar Theses*. Retrieved October 24, 2014, from http://digitalcommons.uconn.edu/srhonors_theses/153

Trudeau, N., Macleod, A. A., Sutton, A., & Thordardottir, &. E. (2011). The acquisition of consonants in Que´be´cois French: A cross-sectional study of pre-school aged children. *International Journal of Speech-Language Pathology*, 93-109.

Velleman, S. L., & Vihman, M. M. (2006). phonology development in infancy and early childhood: implications for theories of language learning. In *phonology in infancy and childhood* (pp. 25-50).

Vihman, M. M. (2014). *Phonological Development: The First Two Years* (Second ed.). Chennai, India: JohnWiley and Sons, Inc.

Wako, T. (1981). The Phonology of Mecha Oromo. Addis Ababa: Unpublished MA Thesis: Addis Ababa University.

Wakweya, O. (2014). Inflectional Morphology in Oromo. Addis Ababa: Unpublished MA thesis Addis Ababa University.

Waterson, N. (1987). *Prosodic phonology: the theory and its application to language acquisition and speech processing.* Newcastle upon Tyne: Grevatt & Grevatt .

White, L. (2003). *Second Language Acquisition and Universal Grammar.* Cambridge: Cambridge University Press.

Wiese, R. (2001). The Phonology of /r/. In T. A. Hall (Ed.), *Distinctive Feature Theory* (pp. 335-368). Berlin: Mouton De Gruyter.

Wyllie-Smith, L., Mcleod, S., & Ball, M. J. (2006, June). Typically developing and speech-impaired children's adherence to the sonority hypothesis. *Clinical Linguistics & Phonetics, 20*(4), 271–291.

Yuen, I., Miles, K., Cox, F., & Demuth, K. (2014). The syllabic status of Final consonants in early speech: a case study. *J. Child Lang.*, 1-13.

Yule, G. (2006). *The study of Language (third Edition).* Cambridge: Cambridge University Press.

Zaborski, A., & Ali, M. (1990). *Handbook of the Oromo Language.* WydawnictwoJ, Wroclaw; Poland: Zaklad Narodowy.

Zamuner, T. S. (2003). *Input-based phonological acquisition.* New York: Routledge.

Zamuner, T. S., & Johnson, E. K. (n.d.). Methodology in Phonological Acquisition Assessing the Joint Development of Speech Perception and Production. Retrieved December 30, 2014, from http://www.utm.utoronto.ca/infant-child-

centre/sites/files/infant-child-centre/public/shared/elizabeth-johnson/Zamuner_Johnson_handbook.pdf

Zamuner, T. S., Gerken, L., & Hammond, M. (2004). Phonotactic probabilities in young children's speech production. *Journal of Child Language*, 515–536.

APPENDICES

Appendix A: Word List for Assessing Speech Production of Oromo speaking children

No	Orth. Words	IPA Tran.	Gloss	No	Orth. Words	IPA Tran.	Gloss
1	aannan	/ʔa:nnan/	'milk'	30	tisiisa	/tis:sa/	'fly'
2	ashaboo	/ ʔaʃabo:/	'salt'	31	waraabessa	/wara:bessa/	'hyena'
3	baaqilaa	/ba:k'ila:/	'bean'	32	xaafii	/t'a:fi:/	'tef'
4	bishaan	/biʃa:n/	'water'	33	abshala	/ʔabʃa:la/	'astute'
5	boombii	/bo:mbi:/	'beetle'	34	abjuu	/ʔabju:/	'dream'
6	booyyee	/bo:jje:/	'pig'	35	afur	/ʔafur/	'four'
7	culullee	/ç'ululle:/	'eagle'	36	akkam	/ʔakkam/	'how?'
8	damma	/damma/	'honey	37	amantii	/ʔamanti:/	'faith'
9	dhadhaa	/ɗaɗa:/	'butter'	38	baay'ee	/ba:yʔe:/	'many/
10	dugda	/dugda/	'back'	39	cabsuu	/ ç'absu:/	'to break'
11	farda	/farda/	'horse'	40	danfa	/danfa/	'sweat'
12	funyaan	/fuɲɲa:n/	'nose'	41	dhaamsa	/ɗa:msa/	'message'
13	hantuuta	/hantu:ta/	'rat/mouse'	42	bulchuu	/bulça:/	'proper name'
14	harka	/harka/	'hand'	43	gamas	/gamas/	'over there'
15	harma	/harma/	'breast'	44	gamna	/gamna/	'wise'
16	hindaaqqoo	/hinda:kk'o:/	'hen'	45	hadhaa	/haɗɗa:/	'poison'
17	ija	/ʔija/	'eye'	46	har'a	/harʔa/	'today'
18	ilkaan	/ʔilka:n/	'teeth'	47	hojjaa	/hoɟɟa:/	'length'
19	jabbii	/ɟabbi:/	'calf'	48	ja'a	/ɟaʔa/	'six'
20	jaartii	/ɟa:rti:/	'beldame'	49	kanaaf	/kana:f/	'due to this'
21	jilba	/ɟilba/	'knee'	50	laphee	/lapp'e:/	'chest'
22	jaldeessa	/ɟalde:ssa/	'monkey'	51	lenjii	/le:nji:/	'training'
23	leenca	/le:nç'a/	'lion'	52	madda	/madda/	'source'
24	mana	/mana/	'house'	53	moggaa	/mogga:/	'periphery'
25	marga	/marga/	'grass'	54	qabna	/k'abna/	'we have'
26	marqaa	/mark'a:/	'porridge'	55	qarshii	/k'arʃi:/	'money'
27	meexxii	/me:tt'i:/	'fishbone'	56	qarriffaa	/k'arriffa:/	'canine'
28	mixii	/mit'i:/	'ant'	57	qilxuu	/k'ilt'u:/	'sycamore'
29	mucaa	/muç'a:/	'baby'	58	rakoo/rakkoo	/rako:/[/rakko:/]	'ritual'/problem

No	Orth. Words	IPA Tran.	Gloss	No	Orth. Words	IPA Tran.	Gloss
59	nama	/nama/	‘human’	72	reeffa	/re:ffa/	‘corpse’
60	nyaara	/ɲa:ra/	‘eyelid’	73	saddeet	/sadde:t/	‘eight’
61	phaaphaloo	/p’a:p’alo:/	‘bean type’	74	sagal	/sagal/	‘nine’
62	qaccee	/k’açç’e:/	‘whip’	75	salphaa	/salp’a:/	‘simple’
63	qawwee	/k’awwe:/	‘gun’	76	shan	/ʃan/	‘five’
64	qeensa	/k’e:nsa/	‘nail’	77	silga	/silga/	‘colostrum’
65	qottoo	/k’otto:/	‘axe’	78	taayitaa	/ta:jita:/	‘authority’
66	quba	/k’uba/	‘finger’	79	toftaa	/tofta:/	‘technique’
67	raacha	/ra:ççа/	‘frog type’	80	torba	/torba/	‘seven’
68	saanqaa	/sa:nk’a:/	‘door’	81	ulfaataa	/ʔulfa:ta:/	‘heavy’
69	sangaa	/sanga:/	‘ox’	82	urjii	/ʔurʄi:/	‘star’
70	saree	/sare:/	‘dog’	83	walsimaa	/walsima:/	‘harmonized’
71	silmii	/silmi:/	‘tick’	84	yeroo	/jero:/	‘time’

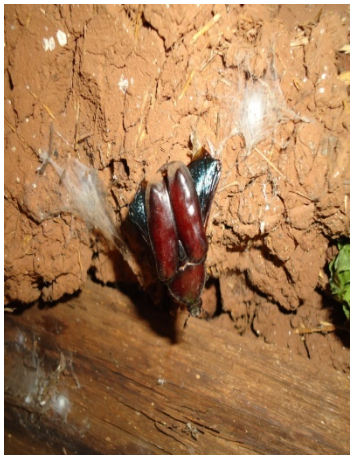
Appendix B: **Target words to test the accuracy of all the Vowel sounds' length**

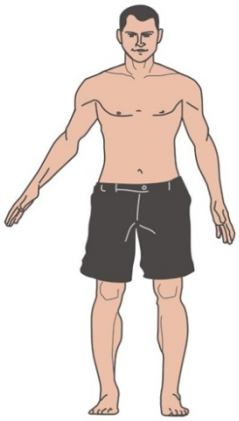
No.	Short	Gloss	Long	Gloss
1	/lafa/	'earth'	/la:fa:/	'smooth' or 'soft'
2	/k'alame/	'slaughtered'	/k'alame:/	'ape'
3	/dida/	'he (I) will refuse'	/di:da/	'outside' or 'somewhere else'
4	/buti:/	'abduction'	/bu:ti:/	'type of snake'
5	/k'oran/	'they examined'	/k'o:ran/	'they (were) wilted'

Appendix C: A Sample Stimulus Picture





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Appendix D: **Sample of Recording sheet: Inventory assessment for word initial position**

No	phoneme	Target word	Response	Transcription
1	/b/	/ba:k'ila:/		
2	/ç'/	/ çululle:/		
3	/d/	/damma/		
4	/ɗ/	/ɗa:msa/		
5	/f/	/farda/		
6	/g/	/gamas/		
7	/h/	/harka/		
8	/ɟ/	/ɟabbi:/		
9	/k/	/kana:f/		
10	/l/	/le:nç'a/		
11	/m/	/muç'a:/		
12	/n/	/nama/		
13	/ɲ/	/ɲa:ra/		
14	/k'/	/k'uba/		
15	/r/	/ra:ççа/		
16	/s/	/sare:/		
17	/t/	/tis:sa/		
18	/w/	/wara:bessa/		
19	/t'/	/t'a:fi:'		
20	/j/	/jero:/		
21	/ʔ/	/ʔa:nnan/		
22	/ʃ/	/ʃan/		
23	/p'/	/p'a:p'alo:/		

Appendix E: **Sample of Recording sheet: Inventory assessment for word Medial position (singleton)**

No	phoneme	Target word	Response	Transcription
1	/b/	ʔaʃabo:/		
2	/ç'/	/muç'a:/		
3	/d/	/di:da/		
4	/ɗ/	/ɗaɗa:/		
5	/f/	/ʔafur/		
6	/g/	/sagal/		
7	/j/	/ʔija/		
8	/k/	/rako:/		
9	/l/	/k'alame:/		
10	/m/	/nama/		
11	/n/	/mana/		
12	/k'/	/ba:k'ila:/		
13	/r/	/ɲa:ra/		
14	/s/	/tis:sa/		
15	/t/	/bu:ti:/		
16	/t'/	/mit'i:/		
17	/j/	/ta:jita:/		
18	/ʔ/	/jaʔa/		
19	/ʃ/	/biʃa:n/		
20	/p'/	/p'a:p'alo:/		

Appendix F: **Sample of Recording: Inventory assessment for word Medial position (Geminates)**

No	phoneme	Target word	Response	Transcription
1	/b/	/jabbi:/		
2	/ç'/	/k'açç'e:/		
3	/d/	/sadde:t/		
4	/ɗ/	/haɗɗa:/		
5	/f/	/re:ffa/		
6	/g/	/mogga:/		
7	/ç/	/ra:çça/		
8	/j/	/hojja:/		
9	/k/	/ʔakkam/		
10	/l/	/ç'ululle:/		
11	/m/	/damma/		
12	/n/	/ʔa:nnan/		
13	/ɲ/	/fuŋŋa:n/		
14	/k'/	/hinda:kk'o:/		
15	/r/	/k'arriffa:/		
16	/s/	/wara:bessa/		
17	/t/	/k'otto:/		
18	/w/	/k'awwe:/		
19	/t'/	/me:tt'i:/		
20	/j/	/bo:jje:/		
21	/p'/	/lapp'e:/		

Appendix G: **Sample of Recording sheet: Inventory assessment for word Final position**

No	phoneme	Target word	Response	Transcription
1	/f/	/kana:f/		
2	/l/	/sagal/		
3	/m/	/ʔakkam/		
4	/n/	/biʃa:n/		
5	/r/	/ʔafur/		
6	/s/	/gamas/		
7	/t/	/sadde:t/		

Appendix H: **Sample of Recording sheet: Assessment of Consonant clusters production**

	C_1 phoneme	**Target word**	**Response**	**Transcription**
	/b/	/ʔabʃa:la/		
		/ʔabju:/		
		/k'abna/		
		/ç'absu:/		
	/f/	/tofta:/		
	/g/	/dugda/		
	/l/	/bulça:/		
		/jilba/		
		/jalde:ssa/		
		/ʔulfa:ta:/		
		/silga/		
		/ʔilka:n/		
		/silmi:/		
		/k'ilt'u:/		
		/walsima:/		
		/salp'a:/		
	/m/	/bo:mbi:/		
		/gamna/		
		/ɗa:msa/		
	/n/	/le:nç'a/		
		/hinda:kk'o:/		

		/danfa/		
		/sanga:/		
		/le:nji:/		
		/sa:nk’a:/		
		/k’e:nsa/		
		/ʔamanti:/		
		/hantu:ta/		
	/r/	/torba/		
		/farda/		
		/marga/		
		/ʔurj:/		
		/harka/		
		/harma/		
		/mark’a:/		
		/k’arʃi:/		
		/harʔa/		
		/ja:rti:/		