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The developmental realization of ejectives by typically developing Amharic speaking children

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Abstract

The current study describes the developmental realization of ejectives by typically developing Amharic-speaking children. It employed cross-sectional research method in order to collect the primary children's speeches data within a given period. Children's speeches data were audio-recorded, using single-words, sentence repetition, and spontaneous elicitation mode tasks. The audio-recorded data were transcribed using IPA and ExtIPA and analyzed. The result obtained from, aged between 3; 0 a and 5; 0, 32 children indicated the different realizations of ejectives. Majority of this age bound children under this study produced the ejective/p'/,/t'/,/k'/,/tʃ'/and/s'/properly and had a target realization when the consonants appeared as a singleton in a word but if they were clustered, they had a possibly to be dropped. On the other hand, there were some children, from different age groups, totally substituted these ejectives by their pulmonic counterparts as/p'/→[p],/t'/→[t],/tʃ'/→[tʃ],/k'/→[k] and/s'/→[s] and these developmental patterns detected in these children's speeches were similar to ones, which have already been reported in other local languages (e.g. Sidamuu Affoo). However, the realization of the ejective /t'/→[tʰ] and/tʃ'/→[th] or [t'] and /s'/→[tʃ'] were uniquely observed in aged between 3;10 and 5;0 three children's production. Such developmental patterns detected at later age might pose surmise whether they are typically language-related or a sign of delay and it may require a depth study including more participants and designing particular task. Generally, this study confirmed that majority of Amharic speaking children were able to master the production of ejective consonants before at age four. However, the complete target realization of such consonants is likely a time taking process, which goes beyond the age bound in some children language development. This implies that some children require continues exposure to these consonants in different word positions and need to have oral practice at school and at home to foster the acquisition process.

Keywords: Language acquisition, language development, phonology, consonant realization, and ejectives

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1. Introduction

Language is one of the defining human characteristics; children of all cultures acquire a native language, and they do so without a need of formal instruction. At first a new born child does not have any knowledge or experience when he/she comes to this world even if he/she is biologically ready to learn from the environment; his/her brain is just like a white paper on which nothing is spotted. However, a child is able to accumulate ideas, thoughts, and expertise through experience and the exposure he/she gets from the surrounding. It is believed that the interaction between nature and nurture plays an invaluable role in children's all-round development in general, and in language development in particular (Pinker, 2004; Sabahat, 2012).

Language acquisition is a process by which children attain the capacity to perceive and understand sound systems, as well as develop different category of lexicons and sentences. Language acquisition is one of a typical child behavior, which can be developed through time and enables he/she to make use of sophisticated means of communication when they grow old (Ferguson, 1964). However, the regularity and speed in which a child acquires target language has prompted researchers to question whether a language is learned in any meaningful sense or not.

This has built long standing theories, which describe the child's language development and acquisition process. On first language acquisition, especially, various studies have been conducted for different reasons, in various approaches at the very depths to describe how the acquisition of language takes place without adults formally teaching them and without conscious learning. This debatable issue for many years has also posed many questions and still studies have been carried out on various features of the target languages to address whether the acquisition process is cross linguistically the same or different. In reference to this, Lust (2006) noted that the growing studies of language acquisition have focused to answer several questions. Some deal with phonological aspects of the language, whereas the others focus on lexicon or morphosyntactic features.

However, from researchers' different areas of focus on children's language acquisition, child's phonology has been the one, which has gained a great attention for many years. Different studies (Beckmanet al, 2009; Ingram, 1974; Rose & Sharon, 2011) have described the acquisition of segmental aspects of language, such as the order of consonant acquisition, mastery of segmental features, like voicing and devoicing. Other researchers have also focused on the development of various suprasegmental features such as syllable structure (Dodd, 1995; Watson, 1997; Demuth et al, 2014), tone, stress/intonation patterns, etc. (Kehoe, 2001) and studies have explained the different features of phonological development and designed different models and theories.

As the theories and models have indicated, most of the phonological acquisition studies have focused for the last three decades in most European

and Asian languages (Ferguson 1964; Ingram, 1989; Wyatt, 1994).However, the acquisition of phonology in many African languages has not been addressed properly despite some studies' reports. For example, Demuth (2010) in the acquisition of Sesseato passives; Takeida (2011) on a significant role caregiver-infant interaction in children's language development and Deen, KamilUd (2002) the acquisition of Nairobi Swahili: The morphosyntax of inflectional prefixes and subjects.

The current study was conducted in Ethiopian, which is one of east African countries where more than 80 languages are spoken. In spite of this fact, studies on the acquisition of Ethiopian languages are very few. Only few studies were traced during this study. In Amharic, Abebayehu (2013) has dedicated chapters of his Ph.D. dissertation to a description of developmental speech sound realizations and Ebenezer (2013) examined the nature of child language and baby talk. Similarly, Tariku (2019) has reported the acquisition of Afaan Oromo Phonology and Abebayehu and Demeke (2017) described aspects of phonological acquisition in children speaking Sidamuu Afoo. These local researchers have made significant contributions towards the efforts to fill the gap in the area of languages acquisition. However, there are number of language acquisition issues, which have not been addressed yet. Thus, the present study aims to contribute to filling the gap by describing the developmental realization of ejectives by aged between 3;0 and 5;0 typically developing Amharic-speaking children. The following questions were also set to be answered in this ongoing research findings.

1.1. Research questions

This study was designed to answer the following questions.

I. How does the developmental realization of ejectives look like in Amharic?
II. What are developmental realization patterns of ejectives observed in aged 3;0 and5;0 years children?
III. What is the theoretical and the practical implications of the finding of the current study?

1.2. Summary of phonological theories

This study aims to describe the developmental realization of ejectives by typically developing children acquiring Amharic language. The result from the current study is believed to contribute to the knowledge of language acquisition in general and the acquisition of Amharic phonology in particular. Therefore, this, the theoretical framework in this section is written as follows. It was also discussed based on the most common types of theoretical frameworks /approaches/ used in language acquisition research. In language acquisition research, the major theoretical argument is between the two frameworks, rationalists, and impressionists. In this regard, literature has tended to focus on the distinguishing between the two theoretical approaches that have proposed different accounts for the

acquisition phonology Bybee,2006). Several researchers show domain-specific models to explain various features of phonological development like how the speech stream is segmented and word learning happens. Along with this proposal, different ideas were suggested on how children identify the speech sounds and produce a word, what shape and representations of lexical entries have, and how they are acquired. Different approaches and models are directly connected to phonological acquisition, which takes place in children's language development process (Renner, 2017).

The general model of phonological development is one of the earliest endeavors; Jackson designed it1968) and grounded his model on diary studies and took it as a paralinguistic period of babbling and a period of phonological acquisition. As his proposal, universal structures guide phonological acquisition; it means, most common sounds cross-linguistically are acquired first. Jacobson's effort was very central to the relatively short history of child phonology and considered as a good promoter for advanced research on child language acquisition and development (Renner, 2017; Stoel Gamon, 2010). On the other hand, Rule-based theory, which was proposed by Chomsky and Halle (1968), has taken into account the generative phonology. The attention of this phonological theory relied on the connection between abstract and surface forms: in other words, it was the only in its time for its' rule-based account of phonology, which tried to show the rules of how phonemes or classes of phonemes were produced under a specified time.

The theory is taken as one of the basic views, which examine a child's speech production by applying a set of phonological rules. As applied to child phonology, generative rules were used to describe children's simplifications of adult phonemes such as[+continuant] segments (fricatives) becoming [continent] (stops) in certain word positions (Smith, 1973). Similarly, Stampe (1969) tried to show the theory of natural phonology which was established by describing a set of universal and native phonological processes. These were used to apply to adult and child speech. As the theory stated, to acquire adult-like phonology, a child needs to pass different processes to learn the sound systems that do not even occur in their language (Stampe, 1972). In short, these approaches comprise levels of the phrase and prosodic words, going down to the grass root and syllable structures. It describes the order of phonological features (Bernhardt & Stumberger, 1998).

On the other hand, Optimality Theory (OT) focuses on the view, which organized input to enhance certain output forms rather than being process-oriented. OT is outcome-oriented theory; it leads child philologists to focus on the system of language acquisition and what is obtained in no adult-like changes in the output instead of focusing on errors (Prince & Smolensk, 2004). In this theory, the child's phonology is described as an actively growing system, but it is not seen as a complete realization of adult phonology. OT proposal deals with a universal set of contradictory constraints of two basic types. The first one is nakedness constraints, which do not allow the existence of marked structures in the output a constraint

on final consonant and faithfulness constraints, which needs the requirement of matching between the input and output (Rose, 2009).

Generally, meaningful language development is a multifaceted process. Concerning phonological development, children must acquire the sounds system to produce words to match the adult targets; they must also understand the phonological forms of words in their native language. This complex process has two essential components. The first one is a biologically based component associated with the development of the speech motor skills required for the production of adult-like words and the second are a cognitive linguistic component associated with learning the phonological system of the ambient language. The cognitive aspect of phonological learning entails the mental representation of sounds, which are stored and accessed in the encoding and decoding of words. Some type of mental representation is necessary for the perception and production of words. To pronounce the word cat, for example, an individual child must have a stored version of the sound sequence associated with the word; the individual child must be able to differentiate the word cat from related sounding words, such as hat, cap, cut, (Clark, 2005; Alqattan, 2015). In the same way, the production of the word cat requires knowledge of the target sound sequence and the articulatory movements that are necessary to distinguish it from other words with similar sound patterns. Therefore, in children's speeches, sound development can be seen from phonetic as well as phonological acquisition (Winitz, 1969).

The development of a phonological system is progressive and needs gradual change. However, the sequence of contrast affects smaller sound units due to the principle of extreme divergent form of the adult phonological systems. Concerning this, Gleason & Nan (2009) tried to show the acquisition of sound systems in terms of the distribution of sound among the world's languages. They have indicated that the most widely distributed sound is the earlier to be acquired. Nasals, front, and stop consonants would be acquired earlier than orals, back consonants, and fricatives, respectively, as children's language differ in certain features from adults. A good example of this is a phonological inventory of children's language in English indicating that children use tore or sore for a store or a gig for pig.

Children are seen they are unable to produce certain sounds or sound combinations of the adult language; they simplify the sound system of language to make up the limitations. Studies on a child's phonology provided a certain process that can be seen in child language (Ingram, 1978 &,1989; Stampe, 1973; Smith,1973; Menn, 1971, 1977). The processes are often expressed as common changes that are seen in children's sound systems. Children often create a suitable sound system for themselves so that they produce an output of their form until they can produce adult-like words. In other words, the processes described as the relations between the adult and the child form.

As far as children's phonological processes are concerned, different scholars (Ingram, 1989; Stoel-Gammon, 2006) categorized the process as cluster reduction, omission, substitution and assimilation (consonant harmony). From different phonological features that children pass through, substitution of one consonant by others has divergent developmental patterns: stopping, fronting, devoicing, backing, gliding as well as de-ejectivisation (in some languages like Amharic). In sum, children pass through certain phonological processes: especially, substitution, in general, de-ejectivisation in particular was the focus of this article.

2. Methodology

The main aim of this study was to describe the developmental realization of ejectives by typically developing Amharic speaking. Such a research in the area of language acquisition often follows longitudinal and/or cross-sectional research designs (Clark, 2003; O'Grady, 2006; Ingram, 1989). However, in this study, cross-sectional research design was used. The researchers preferred to use a cross-sectional study designed to collect data at once in a given point of time across a sample population or a pre-defined subset (Zoltan, 2007). Cross-sectional research design is helpful to include a large representative sample and less demanding to recruit respondents. It also allows researchers to gather a large size of data within a short period. The method helps the researcher to see individual ability of producing various phonological elements. According to Zoltan (2007) explanation, cross-sectional data collection method is less exposed to detrimental factors like unexpected external events that are beyond the researcher control (e.g. children illness, drop out and other)

1.1. Participants

As part of the arrangement and for the choice of appropriate participants, it was made brief discussions with school chief principals on the objectives of the study and why the children get involved. Having the school's consent, 60 children, aged between 3;0 and 5;0 were selected from the two schools. 30 children were from St Michael and 30 from Mentor Academy and the consent letter were sent to those children's parents. The final selection was made by checking parent's agreement and the appropriate information filled. Based on the information collected from fifty returned sheets, thirty–two children who and their parents did not speak other local languages except Amharic, were selected purposively. Sixteen female and sixteen male children were grouped in to four places according to their age with five-month intervals as presented as follows.

Table 1
Participants demographic data

Code	**Name**	**Sex**	**Age**	**Code**	**Name**	**Sex**	**Age**
Group 1				GROUP 3			
C1	TSN	F	3;1;16	C17	BTHY	F	4;5;0
C2	HLN	F	3;2;5	C18	HNA	F	4;5;12
C3	AMN	F	3; 2;23	C19	IDY	F	4;5;19
C4	MKL	F	3;2;14	C20	FKR	F	4;5;2
C5	NTN	M	3;3;15	C21	AMN2	M	4;6;7
C6	ELS	M	3;3:6	C22	KAL	M	4;5;21
C7	HRY	M	3;2;26	C23	EBN	M	4;6;9
C8	EYB 1	M	3;3: 8	C24	EPR	M	4;5;0
Group 2				Group 4			
C9	BLN	F	3;9:23	C25	SOL.M	F	4;11;10
C10	SOL.G	F	3;10:2	C26	SMR	F	4;11:6
C11	DGM	F	3;11:28	C27	RDT 2	F	4;11;20
C12	RDT.B	F	3;10	C28	LDY	F	4;11;26
C13	EYB2	M	3;1017	C29	ELNT	M	4;11;23
C14	AMN 1	M	3;9:24	C30	AMR	M	4;11;12
C15	MKYS	M	4;0:5	C31	NOD	M	4;11:21
C16	BRK	M	3;10:7	C32	EYB.G	M	4;11;2

1.2. Data collection and processing

Children's speech data were collected using single-words, sentence repetition, and spontaneous elicitation modes. The speech data were audio-recorded using a modern audio recorder and transcribed using IPA and Exist IPA. The transcription was done in ELAN linguistic annotator tools as it was easy for phonological segmentation and was helpful to display different words to see the developmental realization of various consonants.

1.3. Data analysis

The study had descriptive data analysis method. Children's speeches were transcribed, using analytical listening technique, following Ashby et al. (1996). First, the analysis was done by classifying the different realizations of the target words. Then, an error identification approach was used. Next, the developmental realizations of different ejective consonants were identified and analyzed. Finally, an attempt was made to forward a possible discussion and conclusion.

3. Findings

In this section, it was attempted to describe and discuss the developmental realizations of ejectives attested in children's speeches production. Due to spatial issue, the other substitution patterns were not included. However, de-ejectivisation of ejective consonants was taken here to refer to the developmental realizations of ejectives by non-ejective consonants.

Table 2
The realization of the ejective /p'/ ⟶ [p]

Process	**patterns**	**Word position**	**Children**	**Age respectively**
De-ejectivisation	/p'/⟶ [p]	WI	AMN,ELS,AMN2	3;1, 3;3,4;6
		WM	HLN ELS,AMN2	3;2,3;3, 4;6,

Example

Process	**Pattern**	**Realization**	**Target**	**Gloss**
De-ejectivisation	/p'/⟶ [p]	etopa/ɨtopa	etiop'ia	Name of Country
		papas	P'ap'a's	Bishop
		təjəpesa(AMN) tərəpesa(ELS,AMN2) t'ələpeza(HLN)	t'ərəp'eza	Table

As the ejective /p'/ does not frequently appear in Amharic word formation, the number of words detected in children's speeches was also very limited. However, it occurred in some words and was realized differently. Most of aged between 4;0 and 5;0 years children correctly produced the ejective /p'/ but there were still some from different age groups who substituted/p'/ [p] in this study. The realization of /p'/ [p] was also reported by Abebayehu and Demeke (2017) in typically developing Sidamuu Afoo children.

Table 2
Developmental realization of /t'/⟶ [t]or[t^h]

Process	**Patterns**	**Word position**	**Children**	**Age respectively**
De-ejectivisation	/t'/⟶ [t]/[t^h]	WI	AMN,ELS,ELN,AMN2	3;1,3;3,3;10,4;6
		WM	HLN,ELS ELN,AMN2	3;2,3;3,3;10,4;6

Examples

	Pattern	**Realization**	**Target**	**Gloss**
De-ejectivisation	/t'/⟶ [t]/[t^h]	tota	t'ot'a	Ape
		kɨtəl	k'ɨt'əl	leaf
		təntʃən	t'ɨntʃəl	rabbit
		tɨkul	t'ɨk'ul	Black
		tɨlle	t'ɨre	Cereals
		ajituan	ajɨt'uan	The rat

From thirty-two children,five of them realized/t'/differently. They substituted /t'/⟶ [t]; For example, the word /t'ot'a/ meaning 'ape', which was detected in all children's speeches, was consistently realized as [tota]. Similarly, the word/t'ɨntʃəl/ 'rabbit as [təntʃən]. These children also realized the target word

/k'it'əl/'leaf' as [kitəl]. However, a 3;10 years old, ELN had a different realizati on of the ejective /t'/⟶ [t^h]. She totally replaced this ejective by aspirated [t^h] in different words.

Table 3
The Realization of /tʃ'/⟶ [tʃ] or[/ t^h]

Process	**patterns**	**Word position**	**Children**	**Age respectively**
De-ejectivisation	/tʃ'/⟶ [tʃ]or[t^h]	WI	AMN,ELS,AMN2	3;1, 3;3,4;6
		WM	HLN,ELS,AMN2 ELT	3;2,3;3,4;6, &4;11

Examples

process	**Pattern**	**Realization**	**Target**	**Gloss**
De-ejectivisation	/tʃ'/⟶ [tʃ]or[t^h]	totutot^h	tʃ'atʃ'utotʃ	chickens
		kutʃ	kutʃ'	sit
		ɨtʃawətaləhu ɨtawotaləhu	ɨtʃ'awətaləhu	I play
		ʧamma	ʧ'amma	shoes
		t^{h}atutot^h	tʃ'atʃ'utotʃ	Chickens
		pɨta	bɨtʃ'a	Yellow
		afɨtʃa	afɨtʃ'a	nose
		tʃɨla	tʃ'ɨla	tail

Like the ejective /t'/, the affricate-ejective/tʃ'/was also produced by most of the children who were under this study; they had matured realization. This enabled to say between aged 3;0 and 5;0 children were physiological mature enough to be able to produce the ejective/tʃ'/ in different word positions although there were still children who had different patterns. These few children realized the affricate-ejective/tʃ'/⟶ [tʃ]or[t^h].For instance, in the word/ɨtʃ'awətaləhu/ 'I play' as [ɨtʃawətaləhu],/ʧ'amma/ 'shoe' as [ʧamma],the ejective /tʃ/ was realized as [tʃ] as indicated in the above examples whereas, the 3;10 year old ELN realized /tʃ'/⟶ [t^h] in her entire words like in the word /tʃ'atʃ'utotʃ/chickens' as [t^hatutot^h]. This girl had a unique realization of different consonants, which were not included in this article. Indeed, children who were unable to produce this ejective had a tendency to substitute by its pulmonic counterpart [tʃ] or [t^h] but 4;11 years old boy ELT substituted/tʃ'/by the other ejective /t'/ like in the word [afɨt'a] for the target /afɨtʃ'a/ mean 'nose'.

Table 4
Realization of /k'/⟶ [k]

process	**patterns**	**Word position**	**Children**	**Age respectively**
De-ejectivisation	/k'/⟶ [k]	WI	AMN,HLN,ELS, AMN2	3;1,3;2,3;3,4;6
		WM WF	AMN,HLN,ELS,AMN2	3;2,3;3, 4;6,

Examples

	Pattern	**Realization**	**Target**	**Gloss**
De-ejectivisation	/k'/⟶ [k]	kɨtəl	k'ɨt'əl	leaf
		tɨkul	t'ɨk'ul	Black
		ɨjələkəmu	ɨjələk'əmu	Sorting
		tɨlɨk	tɨlɨk'	big
		kana	k'ana	Tv channel
		bəkolo	bək'olo	Corn
		kəj	k'əj	Red
		kutɨl	k'ut'ɨr	number

By the same token, like other ejectives, majority of the children were able to produce the ejective/k'/as singleton target consonant but if it was clustered, it might have a possibility to be dropped or substituted. From thirty-two children, who participated in this study, the realization of /k'/as [k] were detected in AMN, HLN, ELS and AMN2. As depicted in the above table, these children substituted /k'/ by its pulmonic counterpart [k] in the initial, medial and final positions. For instance, the word /k'əj/ 'red' as [kəj] and /k'ut'ɨr/ 'number' as [kutɨl] indicated that substitution of /k'/ as[k] at the initial position. Similarly, substitution of /k'/as [k] was also observed at medial position in the word /ɨjələk'əmu/ 'sorting' as [ɨjələkəmu], /bək'olo/ meaning 'corn' as [bəkolo] and at final positions it was found in the word /tɨlɨk'/ 'big' as [tlɨk]

Table 5
Realization of /s'/⟶ [s]or[tʃ']

Process	**patterns**	**Word position**	**Children**	**Age respectively**
De-ejectivisation	/s'/⟶ [s]or[tʃ]	WI	AMN,HLN,ELS	3;1,3;2, 3;3,4;6
		WM ,WF	AMN,HLN,ELS	3;2,3;3, 4;6,

Examples

	Pattern	**Realization**	**Target**	**Gloss**
De-ejectivisation	/s'/⟶ [s]or[tʃ']	səj (ELS)	s'əhaj	The sun
		səgul(HLN)	s'əgul	hair
		tʃ'aj (ELN)	s' əhaj	The sun
		tʃ'ələt(ELN)	s'ələt	pray

It may not be surprising if a few children substituted fricative- adjective/s'/ by its pulmonic counterpart /s/ as it is age related phenomenon but the realization of/s'/ ⟶ [tʃ"] was unique to AMN's production. As far as this fricative-ejective was concerned, it was difficult to reach to a firm conclusion due to its rare occurrence in most children's speeches. Words with fricative-ejective /s'/ were only detected in ten children's speeches, however, except AMN, HLN and ELS, the other children were able to produce it properly. HLN and ELS realized /s'/as [s] in two words but AMN had a different realization. She repeatedly produced the word /s'əhaj/ means 'the sun' and /s'əlot/ 'pray as [tʃ"aj] and [tʃ'əlot] substituting /s'/by the other affricate-ejective [tʃ'].

4. Discussion

This study was conducted by employing cross-sectional research method to take speech's data within a short period. The data collected from different tasks were audio- recorded, transcribed, and analyzed. As the finding of the study in different tables indicated, majority of the children who participated in this study produced the target ejectives properly in different word positions. However, non-target realizations patterns were also detected within the same age group children's speeches. The substitution of ejectives by their pulmonic counterparts like /p'/→[p] ,/t'/→[t] or[t^h], /k'/→[k], /ʧ"/→[ʧ] and /s'/→[s] were apparently common in some children' speeches in this study. Abebayehu and Demeke (2017) also reported such developmental patterns in Sidamuu Affoo speaking children. Similarly, Abebayehu (2008) also described the continuous de-ejectivisation of ejectives by their pulmonic counterparts in Amharic speaking children with speech delay.

In general, majority of three to five years old children, especially, who joined preschool education earlier than others did master the production of ejective as singleton consonants. On the other hand, there were children who substituted these consonants by their pulmonic counterparts. This may be taken as age-appropriate in aged 3;0-3;3 children's speeches as similar patterns have already been identified in other local language (e. g. Sidamuu Affoo) the sin same age level. However, the realization of /ʧ"/→ [t'] or [t^h,] and /s'/→[ʧ"] were uniquely attested in three children's (ELN (3;10) AMN2(4;6) and ELN (4;11) speeches. These patterns of realization attested in aged three to five years children may be taken normal or a sign of delay in their acquisition process requires study in depth including more participants.

5. Conclusion

The development of children's speech production and the realization of the target consonants are likely pre-determined by the amount of input children get from the families and school environment. The continuous oral practice made by the children in different age levels at the school and home fosters the acquisition of different consonants as whole and ejectives in particular.

As researchers' observation, children who had joined to preschool education earlier than others had better production of different consonants. Especially, aged between four and five children pronounced the target ejectives properly. However, the non-target realizations were also attested in some children's speeches and are likely taken as a sign that the complete acquisition of these consonants requires long period until age five or even later than this level. This may have different contributing factors. Hence, in order to understand comprehensively, to come to a sound conclusion and profile the non-target realization of ejectives, large-scale study which include a large number of participants and specific target tasks on Amharic consonant phonemes in general, ejectives in particular, is required. In addition to this, in order to theorize, the non-target realization of ejectives whether they are age appropriate or sign of delay, there is a need to be checked by continuous oral therapy.

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Appendices

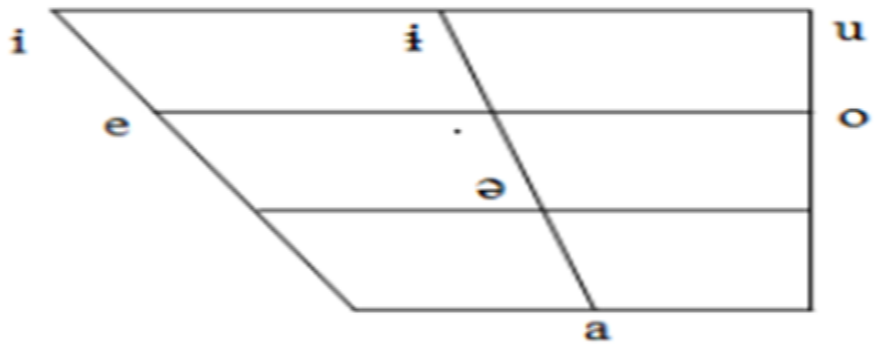
Appendix 1

Amharic consonant phonemes

	Bilabial	Labio-dental	Dental	Alveolar	Postalveolar	Palatal	velar	Glottal
Stops			t	d		k	k g	ʔ
Affricative					ʧ ʤ			
				n		ɲ		
ve		f v		s z	ʃ ʒ			h
Trill				r				
Approximates	W					j		
l				l				
es stops	P’		t’				k’	
ejective affricative					ʧ’			
e fricative				s’				

Appendix 2

Amharic vowels phonemes



Appendix 3

The frequency of the occurrence of different Amharic consonant phonemes

NO	Code	sex	b	d	g	p	t	k	m	n	ɲ	v	f	z	s	ʃ	ʒ	h	ʧ	ʤ	p'	t'	k'	ʧ'	s'	r	l	j	w
1	C1	F	40	4	10	0	111	18	10	48	12	0	17	13	25	18	25	25	30	0	0	0	0	0	1	0	36	27	43
2	C2	F	42	3	14	0	118	20	15	56	4	0	23	22	27	28	18	18	11	0	0	0	0	0	0	0	48	90	124
3	C3	F	40	3	14	0	134	20	35	56	8	2	27	3	20	13	28	18	38	5	0	0	0	0	1	0	48	102	48
4	C4	F	56	23	31	3	150	50	39	73	5	17	18	5	79	50	10	50	50	11	0	0	2	12	0	6	136	74	47
5	C5	M	62	11	12	2	130	59	14	41	9	4	25	13	48	40	13	18	0	8	0	0	0	0	3	0	151	60	59
6	C6	M	53	34	18	5	144	46	40	98	13	0	24	31	49	20	8	31	50	0	0	34	10	11	0	45	120	100	81
7	C7	M	40	18	35	8	135	41	40	69	6	2	22	10	50	16	6	48	65	9	0	15	3	0	0	10	120	62	51
8	C8	M	41	10	30	4	130	37	43	70	3	0	18	12	32	33	3	43	28	0	0	0	0	0	0	0	120	61	40
9	C9	F	65	18	35	12	145	41	40	65	12	3	22	20	64	14	8	43	48	10	0	15	8	13	0	10	130	62	51
10	C10	F	84	58	36	5	247	58	50	135	18	0	30	61	20	13	15	7	50	13	1	33	10	10	4	55	150	80	105
11	C11	F	56	48	33	6	138	45	59	100	14	3	34	43	51	25	20	40	61	13	9	45	15	15	2	12	155	70	100
12	C12	F	15	35	44	25	199	47	50	98	17	3	36	66	79	14	16	58	15	0	0	0	16	0	0	0	153	23	50
13	C13	M	58	45	11	4	164	35	39	58	15	4	32	33	46	20	17	40	5	8	2	33	0	0	3	0	128	64	55
14	C14	M	79	18	15	2	150	68	19	54	12	2	19	21	58	12	13	29	30	10	3	24	2	24	2	15	150	66	71
15	C15	M	58	38	21	3	130	49	47	108	18	0	21	35	54	15	10	35	28	8	0	36	11	23	0	45	120	100	81
16	C16	m	71	39	18	4	125	40	37	122	14	0	30	25	60	13	15	29	42	9	2	39	16	31	4	53	136	89	78
17	C17	F	76	61	44	1	138	59	77	124	18	0	35	64	82	21	56	110	64	10	5	56	18	13	3	60	141	43	115
18	C18	F	71	55	39	3	141	45	62	129	16	0	38	45	74	35	43	102	73	9	3	61	20	17	4	54	150	52	105
19	C19	F	78	47	41	4	150	51	68	133	19	0	33	35	63	40	34	89	81	15	2	49	17	21	3	69	146	48	104
20	C20	F	64	53	46	3	137	48	70	140	16	10	25	10	70	43	56	72	75	21	2	37	19	18	4	74	149	104	89
21	C21	M	41	56	27	18	141	55	76	95	25	0	40	21	48	36	35	63	24	17	0	0	0	0	0	0	160	68	96
22	C22	M	82	65	27	4	147	34	80	100	19	1	25	61	66	15	25	32	18	0	34	41	0	16	5	88	142	110	76
23	C23	M	56	109	51	3	98	93	153	111	24	0	21	174	105	35	0	105	18	0	5	59	25	5	2	50	149	66	163
24	C24	M	105	66	56	7	198	69	63	107	13	3	42	74	124	40	5	45	41	10	0	81	25	15	2	86	158	92	124
25	C25	F	100	54	28	4	157	51	107	107	11	0	45	70	69	10	6	76	53	12	5	78	29	15	5	77	163	70	107
26	C26	F	109	129	74	0	222	69	119	233	22	0	44	80	94	6	0	81	40	11	2	60	53	20	8	107	176	106	183
27	C27	F	138	92	47	2	255	66	169	211	21	0	52	76	96	13	5	103	35	13	2	83	43	21	7	99	222	117	176
28	C28	F	83	77	50	2	193	46	83	113	18	2	51	73	86	20	9	111	48	8	0	37	28	32	4	56	134	133	73
29	C29	M	108	58	51	8	158	76	101	181	20	0	39	65	80	16	8	99	0	10	1	75	16	0	5	0	283	91	77
30	C30	M	82	79	39	3	182	56	99	210	30	1	46	101	82	13	6	102	45	17	2	48	27	34	1	62	165	128	124
31	C31	M	87	69	34	2	158	73	112	163	28	0	57	95	69	10	5	94	48	13	3	50	17	28	2	75	151	99	103
32	C32	M	89	93	56	2	181	67	105	173	10	0	40	100	120	16	4	106	53	10	2	47	21	22	2	80	150	86	94