

# Phonological Simplification Strategies in Oromo-Speaking Children: A Perspective from Optimality Theory

Tariku Negese Oncho

Ph.D.

Assistant Professor of Linguistics

Wollega University

Oromia, Ethiopia

taserese@gmail.com

## Abstract

The present study aimed at investigating the developmental phonological simplification methods in the normally developing Oromo speaking three year olds. Hence, a total of sixteen children from western Oromo speakers were selected. The collected speech samples were transcribed according to IPA. The study utilized Optimality Theory (OT) in investigating the creative adaptations in the speech of the participants. The most frequently encountered strategy was systematic replacement, where markedness outranks faithfulness. The patterns were largely preoccupied with sound preference replacements. Some of these patterns were found to be language-specific, while others declared universality. Full assimilation in clusters was found to be language-specific, but lateralisation, fronting, backing, devoicing, and final consonant deletion were found to be universal patterns across languages. The current research is interested in the intricate interaction of strategies of phonological simplification in the early speech development of Oromo-speaking children and presents information on language-specific as well as universal patterns.

**Keywords:** Oromo, Acquisition, Simplification, Developmental, Dialectal

## 1. Introduction

In the typical course of language development, there often arises a disparity between the linguistic expressions produced by three-year-old children and the target adult forms presented. This discrepancy is frequently attributed to various phonological processes (Dodd, Holm, Hua, & Crosbie, 2003). These phonological processes serve as marker signs of the simplification strategies employed by the children in the face of the inherent complexity of standard adult speech patterns (Crystal, 1997). Such simplification is a result of both the inherent complexity of adult language and to the physical and mental immaturity of the children. In a sense, these simplification strategies entail a set of cognitive processes that lead to changes or omissions of phonological units due to the internal constraints and capabilities of human vocal production and perception. In a sense, it is the dynamic interplay between linguistic development and the evolving cognitive and physical capabilities of three-year-old Oromo-speaking children (Dodd, Holm, Hua, & Crosbie, 2003).

Some of the significant simplification patterns observed in the literature due to cognitive processes involved in phonological development include deletions, assimilations, and insertions. These simplification patterns are generally categorized into two broad classes: structural simplification and systematic substitution strategies. In the process of structural simplification, the original word structure is changed by deleting or adding sounds. As a result, most phonological errors resulting from the use of such structural simplification strategies are usually observed as deletions or insertions in the speech of typically developing three-year-old Oromo-speaking children.

In developmental phonological simplification processes attested in the speech of typically developing three-year-old Oromo-speaking children, systematic substitution occurs when a challenging sound is replaced with a simpler one to pronounce. This process yields a

host of strategies such as assimilation, dissimilation, and free variations. Some of the simplification processes viewed as systematic substitution in children's speech are stopping, fronting, backing, and gliding – types of assimilation. Interestingly, at three years of age, common simplification processes include cluster reduction and gliding, whereas FCD-related errors, voicing, and vowel changes indicate a declining tendency. The substitution strategies initially encompass all articulatory features but gradually decrease as the children's development progresses (Dodd, Holm, Hua, & Crosbie, 2003).

Considering the articulatory features involved, the substitutions represent all the various areas. For instance, processes involving the place of articulation are in the form of velar fronting, coronal labialization, backing, dentalization, debuccalization, and de/palatalization. Changes involving the manner of articulation include gliding, stopping, spirantization, de/affrication, de/nasalization, and de/vocalization. Errors related to the third feature include de/voicing, de/aspiration, and de/glottalization. Notably, such substitution methods are likely to catch the full range of articulatory features first, gradually filtering through as the linguistic abilities of the children advance together with their milestones of growth (Strömbergsson, 2014).

Inconsistencies between input and output forms of language expression extend beyond individual speech sounds to include supra-segmental features such as syllable structure, tone, stress, and intonation patterns. It is not a feature of specific languages, as can be evidenced from its prevalence in various linguistic environments (Hua & Dodd, 2000). These variations have developmental or dialectal processes to them, often referred to as 'errors.' Developmental processes are deviations caused by the child's cognitive immaturity, whereas dialectal processes are reflective of the linguistic strategies employed by the speech community and thus later learned by children as part of their linguistic input. In essence,

these language variations are a reflection of the dynamic interaction between the process of cognitive development and the influence of the surrounding linguistic environment on the speech forms of normally developing Oromo-speaking three-year-olds (Tariku, 2019). The aim of this study is to investigate the strategies employed by three-year-old children, especially Oromo-speaking children, under the parameterization of Optimality Theory (OT).

In the natural course of language acquisition, children simplify their speech and this study attempts to investigate the specific phonological processes used by Oromo-speaking children. Based on OT approach, we can know about how children manage the complexity of language and modify their linguistic production based on their cognitive and physical abilities. Lastly, this research allows us to learn about language development and how phonological processes are integrated with cognitive development in young Oromo-acquiring children.

## **2. Methodology**

The current study investigates the developmental phonological simplification strategies employed by a group of 16 monolingual Oromo-speaking three-year-olds regardless of their socio-economic status. The children were typically developing and did not show any identifiable speech-language conditions. Recognizing the difficulties of controlled experimental procedures with young children, the study adopted a naturalistic observational approach, drawing data from spontaneous speech in contexts such as play activities, tea parties, and conversations during joint play. Using a SONY digital audio recorder at regular intervals, the utterances of the children were recorded and then phonetically transcribed with the use of International Phonetic Alphabet (IPA) symbols.

The analytical framework used in this research took into account the children's speech accuracy relative to the adult target forms. The theoretical underpinning of Optimality Theory

was applied to elucidate the creative phonological changes exhibited by the children at this developmental stage. Distinguishing itself from dialectal analyses, this research prioritized the exploration of developmental phonological processes. To identify these processes, a criterion was established: a phonological process was deemed present if it occurred at least twice within a child's single-word sample.

According to the standards of Dodd et al. (2003), an age-related process of phonology was found within the group when more than 85% of the children within the group used the same process. The approach aimed to provide a full picture of the developmental phonological simplification processes employed by normally developing three-year-olds focusing on the Mecha dialect as per (Fedaa, 2015) classification.

### **3. Results**

Within three-year-old normally developing Oromo-speaking children's speech development, there are independent patterns of phonological simplification taking place, mainly through the operations of assimilation and deletion, which are manifesting themselves with a dialectal flavor. Their speech further reflects a systemic sound substitution tendency. Typically, these children exhibit a tendency to alter the glottal features of sounds, transform flaps into laterals, and alter the typical positions of sounds from back to front or vice versa. Thus, a range of phonological processes including de-gemination, backing, (de)glottalization, fronting, and lateralization are encountered in the language output of the children who were tested. These intricate development phonological measures contribute to richness within the Oromo-speaking child language acquisition tapestry.

One example of some of the more common developmental phonological simplification strategies found in their speech is the replacement of ejectives with their non-emphatic counterparts, such as producing [miti:] for the target /mit'i:] ('ant'). In this example,

the ejective /t'/ was modified to [t], losing its glottal feature. Importantly, this phonological simplification was not restricted to either word-initial or word-medial position; rather, it occurred in both positions of a word. The changes that were witnessed demonstrate how phonological development is dynamic in young children and how they usually simplify those articulatory features which are relatively more challenging during the initial stages of language acquisition.

In the context of developmental phonological simplification strategies observed, it becomes apparent that non-glottal sounds change, at times even appearing as glottal sounds in a simplification of sonority features within clusters. For example, consider the phonetic change which occurs in the word /salp'a:/, wherein the non-glottal sound /l/ is highly saliently substituted for a glottal feature [p']. This substitution not only deals with a glottal sound but can also give rise to a systematic substitution phenomenon referred to as fronting. Consequently, the original form of the word (/salp'a:/ 'easy') is transformed into [sapp'a:], reflecting the child's inclination towards simplifying phonological structures, particularly with the glottalization of sounds and the subsequent effects on cluster configurations. Example (1) shows some additional fronting simplification patterns of the children arising from decreasing the sonority of the sound.

(1)

| <b>Input</b> | <b>Realized</b> | <b>Gloss</b> |
|--------------|-----------------|--------------|
| /jilba/      | [jibba]         | 'knee'       |
| /ʔorma/      | [ʔomma]         | 'foreign'    |
| /garba/      | [gabba]         | 'slave'      |
| /torba/      | [tobba]         | 'seven'      |
| /silmi:/     | [simmi:]        | 'tick'       |

A similar pattern was observed in their speech, where a distinct developmental phonological process known as backing was manifested, as illustrated in example (2).

(2)

| <b>Input</b> | <b>Realized</b> | <b>Gloss</b> |
|--------------|-----------------|--------------|
| /harka/      | [hakka]         | ‘hand’       |
| /k’arfɪ:/    | [k’ajfi:]       | ‘money’      |
| /marga/      | [magga]         | ‘grass’      |
| /ʔilka:n/    | [ʔikka:n]       | ‘teeth’      |

Furthermore, an examination of developmental phonological simplification strategies revealed the occurrence of systematic substitution among Oromo-speaking children, particularly involving the substitution of the flap sound with a lateral. This linguistic phenomenon, termed lateralization, was observed when the phoneme /r/ was realized as /l/ in various word positions. A good example of this process was seen in the pronunciation of /ʔafur/ ‘four,’ which was realized as [ʔaful], showing the substitution of the flap /r/ with a lateral. Surprisingly, the acquisition of /r/ seen to have been harder for these typically developing three-year-old children. Consequently, instances of lateralization were sometimes witnessed in their speech, as is evident in Example (3). This developmental phonological simplification strategy accounts for the dynamic and adaptive nature of language acquisition in this specific linguistic context.

(3)

| <b>Input</b> | <b>Realized</b> | <b>Gloss</b> |
|--------------|-----------------|--------------|
| /marga/      | [malga]         | ‘grass’      |
| /harka/      | [halka]         | ‘hand’       |
| /k’arfɪ:/    | [k’alɪ:]        | ‘money’      |
| /farda/      | [falda]         | ‘horse’      |

/mark'a:/            [malk'a:]            'porridge'

There are certain restrictions in the three-year-old typical Oromo-speaking children's speech that avoid the realization of certain phonological features, such as the flap, based on Optimality Theory (OT). In such cases, the constraint of markedness Not ([+Flap]) is more highly ranked than the constraint of faithfulness (IDENT [F]) (Tariku, 2019). The subsequent relationship can be accounted for within the theory established in (4).

(4)

**Not ([+ Flap]):** The flap consonant ([r]) is not permitted.

Devoicing is also another crucial phonological simplification pattern that was observed in the production of the children. It is a process by which a sound is changed from a voiced to a voiceless state. In the context of this study with this age group, devoicing was found to occur, especially as systematic replacement within consonant clusters. The major process that was identified in the speech data of the Oromo-speaking children was the reduction strategy. This was a clear indication that this is one of the developmental phonological simplification processes.

(5)

| Input       | Realized                | Gloss               |
|-------------|-------------------------|---------------------|
| a./silga/   | [silka]                 | 'colostrum'         |
| b./harka/   | [hakka]                 | 'hand' <sup>1</sup> |
| c./torba/   | [t <sup>w</sup> orpa]   | 'seven'             |
| d./jilba/   | [jilpa]                 | 'knee'              |
| e./ç'absu:/ | [ç'aps <sup>w</sup> u:] | 'breaking'          |

This process of phonological simplification had high frequency in the speech patterns. The cases that were noticed involved the change of the voicing feature of the bilabial stop to

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<sup>1</sup> Gemination also ensued as a consequence.

supply the voiceless [p]. Devoicing of the labial stop to this uncommon sound in the language was especially noticeable when this occurred as a second member in a cluster with liquids. Also, the bilabial stop was devoiced to agree with the voiceless alveolar fricative /s/. Furthermore, the examples indicated where the liquid /r/ and the voiced velar stop /g/ assimilated to [k].

We can take an Optimality Theory (OT) approach to defining the conditions on devoicing, bringing out the ranking of the ONSET (-Voice) constraint. This, therefore, is the constraint demanding the voiceless consonants to occupy an Onset position and this is prioritized over the faithfulness IDENT[F] constraint. Exceptionally (b) here favors the Coda Condition CODA-COND. As per the OT principles, the heterorganic cluster inputs must be overridden by CODA-COND, and the optimal analysis removes one of the place features of the consonants in the clusters. The deletion suggests any of the consonants delete place features, which, in turn, violates the IDENT [F] constraint.

Moreover, the phenomenon of devoicing was observed in word-final positions, affecting the /n/ and some vowels that are short, as exemplified in Example (6). This showcases the versatility and prevalence of developmental phonological simplification strategies in the early linguistic development of Oromo-speaking children.

(6)

| <b>Input</b> | <b>Realized</b> | <b>Gloss</b> | <b>Input</b> | <b>Realized</b> | <b>Gloss</b> |
|--------------|-----------------|--------------|--------------|-----------------|--------------|
| /lama/       | [lama̰]         | ‘two’        | /nama/       | [nama̰]         | ‘human’      |
| /na:ra/      | [na:ra̰]        | ‘eyebrow’    | /mana/       | [mana̰]         | ‘house’      |
| /ʔija/       | [ʔija̰]         | ‘eye’        | /ʔa:nan/     | [ʔa:nan̰]       | ‘milk’       |

In all of the given examples, the last voiced sounds, which include both the vowel and the nasal alveolar sounds, were going through a process of devoicing. The particular


deviation process is usually referred to as word-final devoicing. It is worth noting that, in most participants; the last nasal sound usually gets dropped but undergoes a gradual process of devoicing. Looking at these linguistic patterns, the conditions required for producing the effects seen are the constraints \*VOICEDV# and IDENT[F]. The first one is precisely defined as:

(7)

\*VOICEDV#: Voiced short vowels are disallowed word-finally.

There is one important gap mentioned in the patterns of language as it occurs: voiceless short vowels that are neither in phonological realization nor even in grammatical structure. The constraint \*VOICEDV# can therefore be strongly implied to rank high, indicating priority for voiced vowels. Hence, by logical consequence, IDENT [VOICE] would be ranked lower, as the presence of voiceless vowels in children's speech is indicative of tolerance for such phonological units at the surface. The above observation regarding the developmental phonological simplification strategies tells us about how voiced vowels are prioritized and accommodated in the linguistic repertoire of these Oromo speakers.

(8)

| Input: /lamaḡ /  | *VOICEDV# | IDENT[VOICE] |
|--|-----------|--------------|
|  a. [lamaḡ] |           | *            |
| b. [lama]  | *!        |              |

The tableau demonstrates the important ranking that led to the exclusion of Candidate (b), primarily due to the dominance of the markedness constraint \*VOICEDV#, which prohibits final voiced short vowels. However, the winning candidates incur violations of the identity constraint IDENT [VOICE]. With its lower ranking, however, these violations are permitted and accepted in the phonology under analysis. This intricate interplay of constraints

sheds light on the developmental phonological simplification strategies of final vowel devoicing by the children.

The second significant phonological simplification process observed in the speech of three-year-old typically developing Oromo-speaking children is nasalization. In this process, non-nasal sounds are nasalized, acquiring the nasal feature from neighboring sounds. While this simplification pattern is dialectally motivated, it also possesses developmental characteristics. For instance, nasalization of a vowel can delete a nasal sound from the word-final position, as seen in (9). Consequently, children employ adaptive changes to the phonological structure of these words to facilitate their simplification process. This intricate interaction between dialectal influence and developmental adjustment testifies to the dynamic process of phonological simplification their speech.

(9)


| <b>Input</b> | <b>Realized</b> | <b>Gloss</b> |
|--------------|-----------------|--------------|
| /ʔafur/      | [ʔafu]          | ‘four’       |
| /ʔisa:n/     | [ʔisa:]         | ‘they’       |

The example illustrates the elision, a process known as final consonant deletion (FCD). FCD is a common process in children's phonological development due to the constraint of markedness known as NoCoda, which demands that a syllable not have a coda. The constraint initially overrode the faithfulness constraints in early phonological processes. Here the deleted nasal consonant preceding the vowel becomes nasalized, indicating loss of the final nasal sound. As per the structure of Optimality Theory (OT), both [biʃã:] and [ʃã] are candidates each more conforming to the input, requiring identity of features between the input and output, specifically for vowels' nasality.

Consequently, the nasality feature spreads by a spreading mechanism to the vowels due to the prevalence of the markedness constraint #CV [+nasal]. The constraint necessitates that penultimate vowels followed by a nasal consonant get nasalized. This operation overpowers faithfulness constraints such as IDENT because all penultimate vowels followed by a nasal consonant share the same feature as nasality with the preceding consonant. The result is both the appearance of nasality over [biʃã:] and [ʃã] and the presence of increased vowel duration in 'five,' independent of its nasalization.


For a better insight into this phonological process, the tableau below shows the hierarchical ranking of the constraints in the OT framework.

(10)

| Input: /ʔafur/  | NOCODA | MAX | IDENT [F] |
|---|--------|-----|-----------|
|  a. [ʔafu] |        | *   | *         |
| b. [ʔafur]  | *!     |     |           |

Another striking phenomenon in their speech is de-gemination. Degemination is a process where a geminate consonant loses its typical length. This observation underscores the strong effect of the NOCODA constraint on the phonological simplification strategies used by Oromo-speaking children in the cases under consideration. NOCODA's salience in these cases can be explained within the Optimality Theory framework, as shown in (11). This model offers useful insight into the complex interrelation of constraints placed upon the development phonological simplification strategies these children use during their initial language productions.

(11)

| Input: /k'arriffa: /   | NOCODA | MAX | IDENT [F] |
|--|--------|-----|-----------|
|  a. [karifa:] |        | *   | *         |

|                |    |  |   |
|----------------|----|--|---|
| b. [karriffa:] | *! |  | * |
|----------------|----|--|---|

In the phonological development of Oromo children, velarization is an instance where a non-velar phone changes its place of articulation and becomes velar. As a process in general, the phenomenon is widespread in the language, though the instance is highly predictable, especially when the alveolar nasal /n/ is preceded by a velar sound immediately. The same occurrences have been noted in the speech of three years old typically developing Oromo speaking children. In these cases, alveolar nasal /n/ becomes velarized, as its point of articulation shifts to velar under the pressure of the contextually surrounding velar consonants. The developmental patterns displayed in (12) reflect special phonological simplification strategies that the children adopt in their speech and therefore point to one characteristic feature of their language development. (12)

| Target    | Realization | Gloss      |
|-----------|-------------|------------|
| /marga/   | [magga]     | 'grass'    |
| /mark'a:/ | [makk'a:]   | 'porridge' |
| /ʔilka:n/ | [ʔikka:]    | 'teeth'    |

#### 4. Discussion

This study aimed to explore the phonological simplification strategies used by three-year-old Oromo-speaking children. In this study, single-word speech samples obtained from a group of 16 children aged 3;0 were analyzed. The results indicated that the most frequently occurring phonological processes are similar to those reported in studies on other languages. Despite variations in phonological processes across languages, Oromo-speaking children exhibit developmental systematic substitutions and structural simplifications. Structural simplifications were specifically noted when the final consonant (alveolar nasal) was omitted. Within systematic substitutions, lateralization and devoicing emerged as the primary error patterns in the speech patterns of these children.

This study found some phonological processes that are similar to those seen in children's speech development in other languages, such as Swahili, Putonghua, and English (Gangji, Pascoe, & Smouse, 2014; Dodd, Holm, Hua, & Crosbie, 2003), Igbo (Nwokah, 1986), Sesotho (Demuth, 2007), and isiXhosa (Maphlala, Pascoe, & Smouse, 2014). The similarities underscore the universality of certain phonological simplification strategies employed by typically developing three-year-old children, aligning with patterns documented in diverse linguistic contexts.

For instance backing and fronting have been repeatedly identified in the speech of children acquiring English (Dodd, Holm, Hua, & Crosbie, 2003) and Arabic (Amayreh & Dyson, 1998), nevertheless they are hardly witnessed in the speech patterns of Putonghua-speaking children. Contrary to this expectation, only 16% of the Putonghua-speaking children demonstrated the shown pattern and backing was the second most frequent of the observed speaking patterns (Hua Z., 2002). Also, expectedly, all the processes were highly significant in their speech, again attesting to the prevalence in these children's language development milestones.

However, while studying the speech patterns of typically developing three-year-old Oromo-speaking children, some of the phonological processes reported for other languages were not observed to occur, including the processes of reduction and initial consonant deletion. Whereas cluster reduction and final consonant deletion are frequently found in English, no examples of cluster reduction were found in Oromo, but the final consonant was deleted occasionally. Similarly, while isiXhosa-speaking children often exhibit processes like de-affrication, deaspiration, de-nasalization, gliding of liquids, and stopping (Maphlala, Pascoe, & Smouse, 2014), these were not observed in the speech of Oromo-speaking children. Additionally, similar to Swahili-acquiring children, the sound /r/ posed challenges for Oromo-speaking children, being one of the most difficult sounds to articulate. Thus,

lateralization emerged as the predominant phonological process, characterized by substituting a /l/ for the /r/ sound, a phenomenon occasionally referred to as preference replacement. It's worth noting that lateralization, unlike in English, was not a widespread process across languages.

The study indicated that one of the common strategies used by the children is the substitution strategy of devoicing. Devoicing is a process by which a voiced sound becomes voiceless. For instance, [torpa] was used instead of the target /torba/ for 'seven.' On the other hand, the children preferred using the voiced sound to substitute the voiceless ones. Another substitution pattern identified was the change of the alveolar fricative by fronting or backing. Most interestingly, in Swahili, this was only a case of fronting, especially when dentalized-a feature that differs from English.

## **5. Conclusion**

The investigation into simplification strategies in the speech of typically developing Oromo-speaking children excluded consideration of dialectal variations, as these processes persist throughout the children's developmental stages. The utilization of developmental simplifications appeared to be limited. The predominant phonological process observed in the children's speech was substitution, involving the replacement of one class of sounds with another. This substitution exhibited a degree of systematicity.

Noteworthy error patterns within the children's speech included glottalization, de-glottalization, and devoicing. De-glottalization was more apparent with /k'/ and /c'/, which were acquired relatively late. Glottalization takes place when alveolar and bilabial ejectives are combined with liquids. Devoicing in consonants and vowels in different positions was commonly present in the participants' speech sounds. For instance, /b/ was frequently devoiced in medial and/or initial positions.

The other strategies attested include consonant devoicing, de-gemination, (de)glottalization, lateralization, and palatalization-mostly with alveolar fricatives. However, all these processes seem to persevere beyond the age indicated above. Unfortunately, the scarcity of studies on Oromo and other Ethiopian languages make it difficult to conclusively determine the age at which these processes are inhibited.

Given the scant research in this linguistic setting, drawing conclusions is cumbersome. Further studies with an increased sample of children are warranted to fill this gap. Further research in these areas will elaborate on the details of the phonological processes and inform us whether the phenomena observed are indeed typical for Oromo-speaking children and whether the 'idiosyncratic' processes identified in this study are really unusual or quite common in typical language development. This would, on the other hand, ensure a complete insight into the phonological development of the children and add up to the valued database in linguistics as a whole.

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## **7. Ethics Approval**

The study was keenly aware of ethical considerations, starting with official letters from Wollega University addressed to district leaders, where the research goals and objectives were detailed. Parental consent was sought to conduct audio recordings with their children, and before data collection could begin, both children and carers were informed about issues relating to autonomy, privacy, and possible consequences. Parental consent was a prerequisite, emphasizing their right to refuse involvement without justification. To maintain privacy, reference numbers were given to the participants. It was assured that no harm or malice would be done to the willing participants throughout the research.

**Conflict of Interest:** The corresponding author, on behalf of second author, confirms that there are no conflicts of interest to disclose.

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## Bibliography

- Amayreh, M. M., & Dyson, A. T. (1998). The Acquisition Of Arabic Consonant. *Journal of Speech, Language & Hearing Research*, 642-653.
- Crystal, D. (1997). *The Encyclopedia of Language and Linguistics*. Cambridge: Cambridge University Press.
- Demuth, K. (2007). Sesotho Speech Acquisition. *The International Guide to Speech Acquisition*, 528-538.
- 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.
- 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>
- 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.
- 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.
- Maphlala, Z., Pascoe, M., & Smouse, M. R. (2014). Phonological development of first language isiXhosa-speaking children aged 3;0- 6;0 years: a descriptive cross-sectional study. *Clinical Linguistics & Phonetics*, 176–194.

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

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.

Tariku, N. (2019, July). Acquisition of Oromo Phonology by Typically Growing Children. Addis Abbaba: Unpublished PhD Dissertation; Addis Ababa University.