

<http://dx.doi.org/10.4314/gjl.v12i1.2>

## ASSESSING THE PHONOLOGICAL PROCESSES IN AKAN CHILD LANGUAGE

*Isaac Nyarko*  
*Kwasi Adomako*  
*John Odoom*

This paper seeks to examine the phonological processes embedded in the speech errors of child phonology in Akan, a Niger-Congo (Kwa) language. The study has become necessary because cross-linguistically, several works have been undertaken on child language acquisition but very little or no attention has been given to that of Akan. Most of these works on African languages have centered on the acquisition processes with little on the phonological processes underpinning child language. Therefore, this study bridges the gap by providing a discussion of some phonological processes that underline the acquisition of Akan children. In the course of the phonological development of the Akan child as part of language acquisition, these processes occur as phonological simplification strategies to resolve relatively challenging natural adult forms of Akan expressions. This is either due to an articulatory accident or a defect in the speech organ. It is against this backdrop that Fromkin (1973) opines that a slip of tongue is evidence of a phonological process in action. Hence, this paper concludes that the inadequacies in child language acquisition trigger various phonological processes such as vocalization, stopping, de-affrication, anteriorization, fronting, cluster reduction, reduplication as a phonological simplification strategy in the acquisition of Akan.

Keywords: Phonological processes, Speech errors, Child language, Slip of tongue, Akan.

### **Introduction**

In child language and non-native speakers' phonology, it is observed that there are so many inaccuracies and errors. These inaccuracies are rich in phonological processes. The focus of this paper is to examine such phonological processes through child language acquisition which is an important research subject in linguistics in recent times. Studies on child language development are often carried out in English and other Indo-European languages. A close assessment of the literature on child language acquisition indicates

that Bantu and other southern African languages have received much attention on how children develop speaking competencies in these languages. In this regard, mention is made of studies such as Demuth (1993, 2003) on the Sesotho language, Suzman (1991), and Pascoe and Jeggo (2019) on the Zulu language, Mowrer and Burger (1991); Gxilishe (2004) among several others on Xhosa. Within the Niger-Congo language family, Nwokah (1986), Oyebade (1990), and Adeniyi and Adeniyi (2017) have undertaken a similar study on Igbo and Yoruba respectively. With regard to Ghanaian languages belonging to the Niger-Congo (Kwa) family, studies on child language acquisition comprise Adjei (2002) on Ewe, Kpogo (2016) on Ga, Saah (1994), and Amoako (2020) on Akan.

However, irrespective of the typological dissimilarities in the various languages, the obvious findings from all these studies are that children encounter inadequacies in the acquisition of language. As part of the consensus, it is asserted that the child language acquisition phenomenon is not disorganized (cf. Stemberger & Bernhardt 2018). That is, the process of language development likely follows a natural order with few variations. In child language segmental phonology, it is noted that the child builds up sound inventory beginning from less challenging to more challenging segments. The same can be said of sound clustering, syllable development, and other prosodic features in various languages.

Consequently, in Akan, a recent study by Amoako (2020) observes that the acquisition order as in many other languages begins from stops and ends with laterals as follows: stops, nasals, fricatives, affricates, glides, laterals in that sequence. However, there is also an admission of the possibility of overlap and variation in the acquisition process. The implication is that stops and nasal sounds develop earlier whereas fricatives and affricates have a late development by the child. It is believed that from age 2, the child continues stocking up sound inventory to age 6 and 7 where the child attains a level of conformity with an adult inventory. For instance, all other things being equal, it is noted that before age 5, cross-linguistically, the child is yet to develop the ability to produce affricate segments. As a result, between the phases of age 2-6 precisely, child phonology has a segmental shortfall and inaccuracies. Following these inaccuracies and limitations, the child adopts various repair strategies to overcome their shortfall in the pronunciation of morphs and morphemes featuring the unattained or imprecise segment(s) at a particular period. The repair as a form of simplification strategy on the difficult morpheme for the child consequently sparks various phonological processes. These phonological processes are grouped into substitution process, assimilation process, and syllable structure processes. Therefore, this paper seeks to add the various phonological processes of child language to the existing ones in Akan.

## The Akan Language

Akan as a descriptive characteristic refers to an ethnic as well as a specific linguistic group of people in Ghana and part of the Ivory Coast. In Ghana, geographically, this group of people predominantly occupy the southern (including the Oti enclave carved out of the Volta Region) and middle part of Ghana. The Akan with its various subdivisions has an identical culture and a language with intricate relationships leading to mutual intelligibility. According to Agyekum (2006), the language consists of about ten (10) related dialects that include Asante, Akuapem, Fante, Agona, Assin, Ahanta, Akyem, Wassa, Bono, etc. From the lists of dialects, it is only the three major dialects; Asante, Akuapem, and Fante that have achieved literary status. Nine out of the sixteen regions in Ghana are predominantly occupied by Akan speakers and they speak any of the dialects as their mother tongue. These regions are Central, Eastern, Ashanti, Western, Western North, Bono East, Bono, Oti, and the Ahafo regions. However, due to migration, Akan speakers can be found across the length and breadth of the country. It is for this reason that it is statistically estimated that over 50% of Ghana's population either speaks or understands the three major dialects as an L1 or a lingua franca. Therefore, due to its dominance and wider coverage, it is not out of place to claim that Akan is the most widely spoken language in Ghana.

## Overview of Akan Sounds System

### Akan Vocalic Inventory

Akan has ten (10) oral vowels [ **i, ɪ, u, ʊ, e, ɛ, o, ɔ, a, æ** ] at the systematic phonetic level (Schachter & Fromkin 1968; Clements 1976; Dolphyne 1988; Eshun 1993; Abakah 2002, 2006, 2013) and five (5) phonemic nasal vowels [ **ã, ĩ, ĩ̃, ũ, õ** ] (Eshun, 1993; Abakah 2002, 2006, 2013; Manyah, 2008; Dolphyne, 2006). In terms of their distribution, eight vowels [ **i, ɪ, e, ɛ, a, æ, ɔ, o** ] occur word-initially in Fante and six [ **e, ɛ, a, æ, ɔ, o** ] in Akuapem and Asante. All the ten (10) phonetic vowels occur at the word medial position. In Fante, all the ten phonetic oral vowels occur word-finally. However, in Asante and Akuapem, only nine (9) vowels [ **i, ɪ, u, ʊ, e, ɛ, o, ɔ, a** ] occur word-finally (Abakah, 2006; Odoom, 2011). The vowel [æ] is allophonic, not phonemic. It is in complementary distribution with [a], where [æ] occurs before advanced high vowels and [a] occurs elsewhere (Clements, 1981, 1984; Stewart, 1983; Dolphyne, 1988; Abakah, 2004; and Adomako, 2015). Dolphyne (1988) explains that [æ] is a predictable [+ATR] allophonic variant of [a] before a following [+ATR] vowel. The chart below shows the ten phonetic oral vowels in Akan.

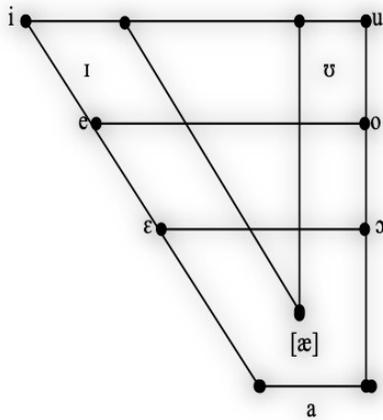


Figure 1: Akan Vowel Chart (Odoom, 2011)

Akan has four high vowels [i, ɪ, u, ʊ]. Akan vowels are also distinguished on the robust [±ATR] feature based on the root of the tongue as shown in the following [+ATR] vowels [i, e, u, o, æ] and [-ATR] vowels [ɪ, ε, a, ɔ, ʊ]. The [+ATR] vowels assimilate the [-ATR] vowels in a given word domain. The [-ATR] vowels cause the vowel assimilation and the [-ATR] vowels undergo harmonization (Kaye, 1982; Baković, 2002; Pavlik, 2009; Mahanta, 2007) as illustrated in (3).

(1)	+ATR		-ATR	
i.	æduro	‘medicine/drug’	asɛm	‘issue’
ii.	kukuo	‘pot’	abɛ	‘palmnut’
iii.	æsɪtɛɪrɛ	‘sugar’	æɥɪdɪɛ	‘sugarcane’
iv.	etuo	‘gun’	ayɔwa	‘earthenware bowl’
v.	eburoo	‘maize’	nɛɲkwaa	‘comedy/jokes’

The traditional lexical words in example (1a) demonstrates [+ATR] vowel harmony and that of (1b) shows [-ATR] vowel feature value.

#### Akan Consonantal Inventory

Like vowels, the exact number of phonemic consonants in Akan consonantal inventory has generated an ongoing debate. Various scholars have proposed diverse opinions. On the consonantal inventory of Akan, Schachter and Fromkin (1968) mentioned the segments /p, b, t, d, k, g, s, f/ as the only “true” consonants in Akan and /j, w, h/ as glides though not true consonants. The non-vowel nasals /m, n/ were deemed to be predictable

by rule and thus need not be specified at the systematic phonemic level. Thus, aside from the eight consonants above, all other segments including the liquids, [ r, l ] are specified as [ -Consonantal ]. Schachter (1962) asserts that the liquids were borrowed into Proto Akan segmental inventory. Meanwhile, Eshun (1993) and Abakah (2006) on the other hand, have identified fourteen (14) systematic consonantal phonemes namely [ p, b, t, d, k, g, m, n, r, f, s, h, j, w ]. This number is six more than what Schachter and Fronkin (1968) had posited. Abakah (ibid) catalogues a chart of sixty-four (64) phonetic variants of the fourteen (14) consonant phonemes and asserts that excluding the fourteen (14) phonemes, the remaining fifty (50) are derived from the fourteen (14) as a result of the application of some phonological rules. This claim amplifies the earlier position of Christaller (1933) and Dolphyne (2006). However, Adomako (2018a) expands this number by listing the following segments; [tɛɥ, dʒɥ, ɛɥ, dʒ, tɛ, ɲ, ɲɥ] and made the contention that these labialised and alveo-palatals occur before non-front vowels, therefore, are phonemic. He thus includes them on the Akan consonant chart in table (1) below.

Table 1: Akan Consonantal Inventory (adopted from Adomako, 2018a: 9)

	Bilabial	Labiodental	Alveolar	Alveopalatal	Palatal	Labialized alveopalatal	Velar	Labial-velar	Glottal
Stop	p, b		t, d				k, g		
Affricates				tɛ, dʒ		tɛɥ, dʒɥ			
Fricatives		f	s			ɛɥ			h
Nasals	m		n		ɲ	ɲɥ	ŋ		
Approximants	(w)		ɹ		j			w	

### Overview of Phonological Processes

According to Wei (2008), phonological processes are the set of rules adopted to simplify the pronunciation of a language unit. Thus, phonological processes in child phonology are what the child brings to the language in order to simplify complex adult phonological expressions (cf. Younis 2008). This set of simplification rules consist of syllable structure processes, substitution processes, and/or assimilation processes. Each of these processes is a composite process that entails other individual processes. For instance, epenthesis, metathesis, final consonant deletion, reduplication, cluster reduction among others constitute syllable structure processes, while stopping, fronting, backing, gliding among others are components of substitution processes. Any of these phonological processes exist in human language as the set of rules of natural deviation that enhances speech production. However, any of these processes could also emerge as cosmetic measures within child phonology and among second language learners as a mitigation strategy

(Chan & Li 2000). This is expected because, at a certain level of language acquisition, the vocal apparatus of the child might not have developed to the extent necessary to produce appropriate articulations similar to adult forms.

In phonological processes, a phonological constituent being the target unit usually a segment or syllable may lose or acquire a feature in a continuum of partial to absolute terms. The process could completely overturn the primary articulation feature of the target unit. It is from this perspective that Abakah (2012) differentiates between palatalization and affrication in Akan as distinct phonological processes. Thus, a phonological process could probably emerge as a secondary articulation process in segmental phonology together with other syllable structures and assimilatory processes. As a secondary articulation phenomenon, then a phonological process also applies to the set of rules that support the addition of a lesser degree of closure accompanying the articulation of a primary sound. The above elaborations turn in the idea of superimposition of a feature in a cross-section of phonological processes such as labialization, palatalization, and the like.

Assessing phonological processes from the viewpoint of assimilation, Lord (1974: 147) defines it as a change in the properties of a vowel or consonant sound brought about by the influence of a neighboring, usually an adjacent consonant or vowel. This implies that a phonological process may involve an alteration in the features of a sound. The manipulation of the segment could perhaps be projected as a feature addition, narrowing, or an absolute delinking of a feature inherent in a sound. However, the process does not randomly take off but is triggered by another segment within the catchment of the altering sound. The objective of an assimilatory phonological process is to shape a segment or a phonological unit towards a rendition that is more compatible to suit a particular environment. It is a composite process that involves a collection of several other phonological activities of modification on a phonological constituent.

#### Phonological Process in Akan

Various phonological processes have been discussed in a number of literature on Akan. The processes are explored in various works either as an ordinary natural phenomenon in the language or subsumed as having manifestation in a particular phonological aspect in the language. For instance, Adomako (2015) examines some of the phonological processes as reflected in an Akan linguistic game. Again, Adomako (2017) addresses the phonological processes as reflected in the Akan female naming system. Moreover, Boadi (2014) expatiates on the phonological processes that apply to the underlying representation (UR) in Akan to exemplify the phonological differences in the three main dialects. Nevertheless, Abakah (2012) enumerates a number of these processes as inherent in the three main dialects of Akan. The discussion on phonological processes in

the literature of Akan has identified some processes such as palatalization, labialization, labial palatalization, vowel harmony, stridentization, coronalization, dorsalization, velarization, posteriorization among others.

Most of these processes are treated as natural occurrences inherent in Akan to facilitate speech production. Conversely, Chan & Li (2000) argue that a phonological process could be sparked as a synthetic deviation to ease an articulatory challenge. It is in line with this that Fromkin (1973) contends that a speech error is evidence of a phonological process in action. Hence, in this paper, we turn to examine the phonological processes as evidence in the phonology of native Akan-speaking children within the age range of two (2)-seven (7). This target group is plausible because it is the language acquisition phase of child development that is characterized by numerous inadequacies. Due to these phonological inadequacies, children inadvertently adopt various phonological processes in speaking and the production of adult forms. Hence in our subsequent discussion, we gravitate to the discussion of how child language in Akan finds solace in other phonological processes as a resolution to challenging adult expressions.

## **Methodology**

### Research approach and design

This is a descriptive qualitative study to unravel the phonological processes embedded in the errors and inadequacies of child language in Akan.

### Data source

The data for this study were collected from the primary source. Eighty (80) words in varying phonological shapes and sound sequences were compiled. The data were primarily nominals familiar to the children and few verbal items denoting action. Lust (2006) suggests that one prominent method of studying child's knowledge of the language is by studying their language production through play, recordings, and transcription of natural speech. Accordingly, in order to assess the target phonology, the children and corresponding parents were engaged with these pictorial images to act as a stimulus to elicit their pronunciations. Occasionally, for emphasis and confirmation of the phonological process in the error or inaccuracy, respondents were stimulated to repeat the pronunciations through a play around the nominal items. Eventually, with the permission of the parents, the pronunciation of all respondents was recorded.

### Data size

In all, eighty (80) traditional lexical words were extracted from the recordings as the primary data for this study. The 80 extracted primary source data were subsequently compared to pronunciations from the parents as the native speakers of the language.

### Participants

A total of 36 participants comprising 9 males and 9 females children and 18 mothers were purposefully sampled for the study. These children are from 2-7 years. All participants indicated their interest to participate in the project by responding to flyers distributed to them. Participants were required to have not lived outside of Ghana for the purpose of controlling for first language attrition. All participants provided written consent to participate in the project.

### Data collection procedure

Participants were also recorded in their various settings in the homes. For their consent and supervision, a parent of the 18 children was added as part of the respondents to report on their ages. Additionally, the parents were aged 22-40 and comprise of fourteen females and four males. They gave a natural pronunciation of the gathered data for comparison. This brought the total sample size of the study to thirty-six (36). The eighteen children were grouped into 3-6 based on age and phonological advancement. That is, ages 2-3 form one group of six since they had a similar phonological advancement as beginners. Equally, age 4-5 constituted the next intermediary group of six, and age 6-7 formed the last group of six to represent the final phase of phonological development. They were recorded using a recorder and later transcribed.

### Data analysis

The errors were intuitively classified according to the phonological processes involved and were transcribed in the IPA convention for ease and clarity. The descriptive approach was used for the analysis of data.

### Ethical considerations

We stated explicitly to the respondents that the purpose of the research study is to gather data of children who are from 2-7 years in order to provide a comprehensive account of the various phonological processes embedded in child phonology. We explained to the respondents that the data collection exercise was expected to last for about 5 working days. And each recording session lasted for about 3 hours. Their responses were audio-recorded. Although the data collected do not border on confidentiality of the records of

the respondents, we assured the respondents that based on their wishes; we will protect their identity in the data they give out.

### Data Presentation and Analyses

This section discusses the various phonological processes in our data gathered. These phonological processes are categorized into substitution and syllable structure processes.

#### Substitution Processes

In this phonological process, a sound is used to replace another sound in a given word domain. The following are some of the substitution phonological processes in child phonology in Akan.

#### *Stopping/Plosivisation of Stridents in Akan Child Phonology*

In the data collection, it was observed that a common phonological process in child phonology is stopping. Though it was a cross-cutting phonological process that characterizes all the children in the various language acquisition phase, yet, it was predominant among age 2-3 children. This is the phase known for the development of stops and is marked as the starting point of language acquisition. At this stage, it is evident that the only acquired consonant or in the acquisition is the stops. Thus, any other segment such as fricatives or affricates proves relatively challenging to the child. As part of the rehearsal for the articulation and application of the stops, child phonology at this stage treats any other consonant as a plosive. Consequently, the seemingly complex fricatives and affricates as the stridents in a morpheme are substituted. The attempt to de-stridentized a segment in a morpheme is occasioned with the process of stopping. That is, in child phonology, stridentized segments are simplified through another phonological process known as stopping or plosivisation to be precise. The following data (2) illustrates a similar replacement of sibilants in the context of child phonology in Akan especially among age 2-3 children.

(2) Stridents	Adult Form	Child Form	Gloss	Child Age
i. /teɥ/	nteɥom	nɔm	'chickenpox'	2-3yrs
ii. /dzɥ/	ndzɥom	ndom/nbom	'music'	2-3yrs
iii. /te/	teɛɛɛɛɛɛ	kɪkɪ/tɪtɪ/qɪqɪ	'to tie'	2-11 months
iv. /te/	nteɛn	nkɪn/ntɪn	'salt'	2-10 months
v. /dz/	dzina	dina/gina	'to stop'	3-5 months
vi. /dz/	adzɛ	ada/aga	'father'	3-2 months
vii. /f/	mɛframa	mp(b)rama	'air'	3-1 month
viii. /t/	mɪ sɪsɪ	mɪ tɪtɪ	'my waist'	3-3 months

Stridentized morphemes in the adult forms of the above data feature strident segments such as [tɕ, dɕ, tɕ, dɕ, f]. Akpanglo-Nartey (2002) asserts that strident feature is a general acoustic term that refers to all segments such as [tɕ, dɕ, tɕ, dɕ] that have increased turbulence in airflow due to the absolute occlusion and gradual release of airflow. This integrated activity makes it complicated for the developing vocal tract of the child to adjust.

Moreover, as asserted by Stemberger and Bernhardt (2018), Amoako (2020) stridents and affricates are part of the late sounds acquired by the child. Thus, the absence of the affricates in the sound inventory of the child at the pre-affricate development stage compels the child's phonology to resort to a phonological process as a resolution to the absent or challenging sound. Consequently, the phonology of the child relies on the already developed readily available stops such as [p, t, k, b, d, g]. This plosive substitution phonological process that allows the child to simplify the complex segment for onward pronunciation and production of the morpheme is popularly known as stopping or plosivization (Rose 2009).

Again, the other two segments [s, f], though plain fricatives are also simplified by being substituted for [t, p/b] respectively in example (2vii, viii). This substitution is perhaps attributed to the late acquisition of fricatives in language development. The overlap between the two segments; [t] and [s] is possible in child phonology on the basis that the two are closely identical in point of articulation but differ in manner. Positioning two articulators in close approximation for the airstream to escape through a narrow space for turbulence is challenging for the limited articulatory ability of the child.

#### *Partial De-Stridentization in Akan Child Phonology*

In Akan child phonology, particularly among age 4-5, this process of de-stridentizing challenging stridents segments assumes a different realization other than stopping (plosivisation). In this, a different rendition of simplifying stridentized segments such as [tɕ, dɕ, tɕ, dɕ, tɕ, dɕ, tɕ, dɕ, tɕ, dɕ] is applied. Schachter and Fromkin (1968), Abakah (1978), Dolphyne (2006), and Adomako (2015, 2018b) argue that strident sounds [tɕ, dɕ, tɕ, dɕ, tɕ, dɕ, tɕ, dɕ, tɕ, dɕ] in Akan have undergone the process of palatalization. The palatality in these stridents sounds is testified in the formation of a constriction at the palatal location as an accompaniment to a stricture of greater degree in the articulation of these sounds.

The composite articulatory activities tend to be complicated for the 4-5 child developing Akan as a mother tongue. The referred complexity is resolved in the phonology of the child by substituting a simple plain fricative; [f, s] for the complex [tɕ, dɕ, tɕ, dɕ, tɕ, dɕ, tɕ, dɕ, tɕ, dɕ]. This is possible because, at this age 4-5 of the language developmental phase, the child has or is in the process of acquiring ability for sibilants production (Ingram 2008). This

substitution forms part of the phonological rehearsal and resolution of the challenging unit for the child. Until full mastery over strident or sibilant production, the child's phonology resorts to this pattern of replacement. This continuous simplification process eventually enhances the production of stridentized segments by the Akan child. The following data illustrates this partial de-stridentization process.

(3) Stridents	Adult Form	Child Form	Gloss	Child Age
i. /ɛɥ/	mɛɛɥi w(ɔ)	mɛfiw	'I will beat you'	4yrs 1month
ii. /ɛɥ/	ɑɥɥidiɛ	afidiɛ	'sugarcane'	4yrs 3months
iii. /ɛɥ/	ɑɥɥiɥɛ	afifiɛ	'mirror'	4yrs 6months
iv. /ɛɥ/	nɛɥiɾuma	nfiroma/nɣiɾuma	'a whistle'	4yrs 6months
v. /ɛ/	ɛire	fire/sire	'clay food'	4yrs 4months
vi. /ɛ/	ɛpɛɛ	ɣpɛɛ/fɛpɛɛ	'glamorous'	4yrs 2months
vii. /ɛ/	nɛiɛɛi	nɣisiɛi/nfifiɛi	'an arrangement'	5yrs 1month
viii. /ɛ/	ɑɛdi	afɛdi/ɑɛdi	'a command'	5yrs 3months

From data (3), we can see that all morphemes comprise a strident either at the word-initial or medial position in the adult form. These stridents are usually get replaced with a plain strident or fricative [s, f] within the child phonology. This stage probably marks the period where the child is developing the articulatory ability for sibilants. i.e. (intra-sibilant developmental phase). The substitution of [ɛɥ, ɛ] for [f, s] as demonstrated above is not ordinary or accidental but has a phonological underpinning. Notably, [ɛɥ, ɛ] are replaceable with [s, f] because the former and the latter are all [+SIBILANT] or stridents, with the only difference being that the latter is fronted in articulation. It is obvious that for simplicity and articulatory convenience, the phonology of the Akan child opts for a plain strident by the inability to draw the tongue back to the palatal location contemporaneously. This fronting process of partially de-stridentizing [ɛɥ, ɛ] is probably due to the simultaneous approximation and stricture involve in the production of these palatal strident sounds. The vocal tract of the child at this point of language acquisition is yet to gain mastery over these seemingly co-articulation processes. On this account, the child's phonology substitutes a simpler version of strident for the more complex segment. A similar relationship can be drawn from the replacement of [s] for [ɛ] in example (v-viii) whereby both are stridents. However, the substitute [s], is non-back and non-palatal but the target [ɛ] is palatal fricative and a back segment as well.

This substitution process helps to simplify the complex component of stridentality to afford the child some articulatory ease. Nevertheless, stridentality in the target is partially retained with the plain fricative /f, s/ as the replacement. In other words, it is also tenable that the replacement of [ɛɥ, ɛ] for [f, s] de-palatalizes the palatality in [ɛɥ, ɛ] but retains the [+Strident] feature specification. That is, a relatively easier strident depalatalize and replace a complex strident [ɛɥ, ɛ].

*Velar Fronting in Child Phonology*

A velar segment produces at the post-palatal region of the roof of the mouth. This description captures the location from the velum (soft palate) to the onset of the glottal section. On the other hand, fronting as a phonological process refers to the circumstance whereby a post-alveolar sound such as a velar or glottal segment is replaced with a sound that is made toward the front of the vocal tract (Williamson 2010). In this perspective, the pre-palatal region that comprises the alveolar, labio-dental, and bilabial domains of the vocal tract constitutes the frontage of the tract. It aligns with this description that Kresheck et al (1996) contend that fronting fundamentally represents the replacement of a posterior consonant with an anterior consonant. This substitution is common among children within age 2-3 as part of the inadequacies associated with language development.

Fronting usually occurs at the onset of a morpheme than morpheme final. To present a better appreciation of the occurrence of this process, Kresheck et al (1996) cite the phenomenon among English learners where [tæn] is pronounced for [kæn] instead, [ti:] for [ki:], [bæt] for [kæt]. Conditions like these are not limited to English children acquiring the language; it is a cross-linguistic phenomenon and Akan is not an exception. Unlike in the alveolar region, the velar region of the child has a late readiness and maturity for sound articulation. The following data demonstrates velar fronting.

(4)	Posterior Adult Form	Child Form	Gloss	Child Age
i.	ak <u>o</u> ko	at <u>o</u> to	'chicken'	2yrs 3months
ii.	ka <u>k</u> ai	da <u>d</u> ai	'monster'	2yrs 4month
iii.	ko <u>k</u> o	to <u>t</u> o	'porridge'	2yrs 1month
iv.	gu <u>g</u> u	du <u>d</u> u	'to pour'	2yrs 5month
v.	ng <u>g</u> o	nd <u>o</u>	'oil'	2yrs 6month
vi.	ng <u>k</u> ati	nt <u>t</u> ati	'groundnut'	3yrs
vii.	ng <u>k</u> uruma	nt <u>t</u> uuma	'okra'	3yrs

Example (4i-vii) places the velar segment [ k, g,ŋ ] at either the word-initial or medial position. However, the production of these velar segments at their various positions proves challenging for the child, and they eventually get substituted. In the chronological order of consonant acquisition in language development, velars and posterior segments constitute part of the late acquired segments (Fee 2014, Amoako 2020). While posteriors are yet to be developed by the under-age three children, some anterior segments including alveolars, are already developed and active in the child's phonology. Therefore, at the pre-velar development, velars are mostly substituted for alveolars as exemplified above. The substitution is not decisive but rather the inability of the child's speech organs to produce velar segments in morphemes constrains the tongue to surge forward instead for the production of the velar that results in the articulation of alveolars as substitutes. This

deviational phonological rule that permits the substitution of a velar segment like [k, g, ŋ] for an alveolar such as [t, d, n] respectively is described here as the velar fronting.

However, fronting in general as a phonological process entails the replacement of any posterior consonant for an anterior consonant (Kresheck et al 1996). In Akan, aside from the cases of velar fronting as shown in example (4), fronting also triggers the partial reversal of posteriorization as reported in Abakah (2012). Instead of posteriorization at the word-final position in Asante and Gomoa Mfantse as demonstrated in Abakah (ibid), this de-posteriorization in child phonology occurs at the word-initial position with the constrained or forced replacement of the anterior coronal nasal [n] in place of the posterior coronal nasal [ŋ].

(5) Posterior Adult Form	Child Form	Gloss	Child Age
i. <u>n</u> amɪ	namɪ	‘God’	3yrs
ii. <u>n</u> inaa	<u>n</u> inaa	‘all’	3yrs 1month
iii. <u>n</u> ansa	<u>n</u> ansa	‘wisdom’	3yrs 2months
iv. <u>ɛ</u> ɲɔ	ɛna	‘snails’	3yrs 1month
v. <u>ɲ</u> ansɪma	<u>n</u> ansɪma	‘a fly’	3yrs 3months
vi. <u>æ</u> ɲumɪrɛ	ænumɪrɛ	‘evening time’	3yrs 7months
vii. <u>k</u> wamɪ	<u>k</u> amɪ	‘personal name’	3yrs 6month
viii. <u>k</u> wata	<u>k</u> ata	‘leprosy’	3yrs 5months
ix. <u>ɛ</u> ɲɛ	<u>h</u> ɛ	‘to look’	3yrs 9months
x. <u>ɛ</u> ɲɪ	<u>h</u> ɪ	‘to beat’	3yrs 8months

Examples (5i-vi) demonstrate that the palatal nasal /ɲ/ and the labialized nasal /ɲɔ/ respectively are the target posterior segments that have been replaced in the child form. This replacement is not accidental but phonologically conditioned. That is, these posterior nasals have an inherent additional property of palatality [ɲ] and labiality [ɲɔ] that complicate the articulatory process for the amateur vocal tract of the child. The complexity originates from the point that in the production of the palatal nasal, the velum is lowered to block the oral cavity and another constriction is formed between the palatal region and the back of the tongue. These dual articulatory activities occur concomitantly, and it is complex for the child. For the labialized nasal [ɲɔ], the oral cavity is blocked concurrently with the rounding of the lips. Due to the complication in articulation and the resultant absence of the posterior nasal [ɲ, ɲɔ] in the segmental inventory of the child at that period of language acquisition, their phonology resolves the deficit by anteriorizing the posterior [ɲ, ɲɔ] through the substitution of [n] for [ɲ, ɲɔ]. This de-posteriorization retains the nasality component property but drops the palatality and the labiality in the target segment [ɲ, ɲɔ] as evident in the child form.

Similarly, in example (5viii-x), child phonology drops the labial component inherent in the labial velar [kw] and the labialized alveopalatal [ɛw] in favour of a plain velar [k] and the placeless fricative [h]. This is on account that Mensah (1987), Gussenhoven and Jacobs (1998), Ewen and van der Hulst (2001), Abakah (2006) contend that the segment [h] is more placeless with no pre-specification than glottal. However, the substitution is conditioned by the relative complexity and unavailability of the target labialized segments in the child's phonology. Hence, from the viewpoint of the glottality of [h] in the child form with respect to (5vii-x), the replaced and the replacing segment are both posteriors yet [k] and [h] is relatively easier for the child than its labialised counterpart [kw] and [ɛw]. In a nutshell, this substitution in child phonology is not ordinary but phonologically conditioned by articulatory convenience and resolution to a challenging segment.

#### *Lateralization Processes in Akan Child Phonology*

Hitherto, the voiced alveolar lateral /l/ was considered to be completely alien to the Akan consonant inventory. However, with its occurrence in native Akan stems, Abakah (2006) demonstrates convincingly that the lateral /l/ is an indigenous Akan segment but not of borrowed origin as had been earlier assumed. The general position is that the lateral /l/ is in free variation with /r/ and /d/ in almost all the three dialects of Akan. In distribution, /r/ and /l/ commonly occur intervocalically. Though the two coronal consonants /r/ and /d/ are autonomous phonemes, yet the trill /r/ and the lateral /l/ seem to be in complementary distribution i.e., the two occur in a mutually exclusive environment. It is only that in the Mfantse and the Asante dialects, [r/l] are used interchangeably. Due to the free variation between the three coronal consonants, even in obvious situations where a non-lateral, be it either a trill /r/ or a stop /d/ occurs at the input level of phonological representation, these nonlateral coronals are lateralized and they surface as /l/ at the output level. A non-lateral is substituted for a lateral at the output level.

In Akan, it is the phonological relationship of free variation between /d, r, l/ that triggers this lateralization process. This lateralization is not limited to child language phonology but in adult speech, and the phonology of an Akan speaking English too. Perhaps, it has its genesis from child language acquisition as the child imitates adult expressions. However, in an L2, it occurs as a slip of tongue due to L1 interference. The following examples from the phonology of age 6-7 children illustrate this phenomenon of lateralization both in native Akan stems and in loanwords. The trill /r/ and the stop /d/ and other non-laterals are presented at the input level of adult expressions for they are phonemic while the lateral is phonetic as they are realized only at the phonetic level.

(6) Adult Form	Child Form	Gloss	Child Age
i. araba	alaba	'a personal name'	6yrs 2months
ii. ananta	alanta	'bowlegged'	7yrs 4month
iii. fɪɪda	fɪɪda	'a personal name'	6yrs 6months
iv. ɔɪɪba	ɔɪɪba	'is coming'	6yrs 3months
v. ɔɔtɔ	ɔɔtɔ	'a forest type'	7yrs
vi. buɔdo	buɔdo	'bread'	6yrs 5months
vii. buɔdi	buɔdi	'plantain'	6yrs 7months
viii. bɪɪʃ	bɪɪʃ	'brush'	6yrs 7months

Example (6) shows that the non-literal occurring at the level of the input in phonological representation is substituted for a lateral and is mainly due to the relationship of free variation. Regardless of the fact that the lateral /l/ is a free variant of /r/ and /d/, the lateralization at the output level renders it erroneous. The lateralization could be unduly carried out as in example (6iii) especially in an environment where the lateral does not occur intervocally. Such phenomenon stems from the overapplication of the free variation relationship to non-native lexical items. These items have no direct equivalents in Akan and are often code switched but accidentally lateralized as a result of the over-application of intervocalic free variation between alveolar /r/ and /l/. In a related circumstance, the lateral in adult input form gets unduly delateralized by the replacement of a non-lateral. It is noteworthy that this process of lateralization and delateralization is also common in adult phonology just as in the phonology of age 6-7 children.

#### Syllable Structure Processes in Akan Child Language

The acquisition of syllables is an integral part of language development in children. Accordingly, it is said that the acquisition of syllables as a unit in language leads to the formation of formulaic utterances in the course of a child's language development (Peters, 1983). However, in the view of Clark (1982), syllables are acquired in the order of magnitude and along the lines of the segments attained at each phase of the acquisition process. In light of this, it is plausible that the progression and mastery are dependent on the level of complexity and scope of the syllable of the language in question. Various phonological processes are adopted by the child on the syllable to aid speech and mitigate syllable sophistication. Some of these processes include reduplication, cluster reduction, diminution, initial consonant deletion, final consonant deletion, epenthesis, syllable deletion, medial consonant deletion, vowelization, among others.

Akan is known to have simple syllable structures, and as a result, few of these phonological processes are applicable in child language phonology. According to Dolphyne (2006), the basic syllable structure in Akan consists of a V, C, and a CV. This implies that a closed syllable and consonant clusters are non-existing in Akan. This

position is reinforced by Kaye (1985), Adomako (2008) with the assertion that any final consonant constitutes an autonomous syllable. Nevertheless, a CCV string in the onset realized as a CrV seems to contest the non-existence of consonant clusters in Akan. It is out of this contention that Marfo and Yankson (2008) clarifies that a CrV is only a product of two basic CV syllables. Differently put, the CrV structure in Akan that appears to be contentious is only a phonetic representation of a basic two-syllable string of CV<sub>1</sub>rV<sub>2</sub> which has been subjected to re-syllabification following a reduction in one of the two syllables. Precisely, in the processing of the input to derive a CrV<sub>2</sub>, there occurs an elision of the vowel in the preceding CV structure. This reduced syllable then constitutes CrV<sub>2</sub> with the succeeding rV structure integrated into the initial CV syllable in phonological representation. From Marfo & Yankson (2008) perspective, the derived CrV structure after the elision of the V<sub>1</sub> is then re-syllabified into CrV<sub>2</sub>. This syllable reduction and re-syllabification is triggered by an economy of speech as stated in Bencivenga (1987), Bresnan (2001), and it is on this grounds that the CrV<sub>2</sub> is a product in phonetic representation than an autonomous basic syllable structure. The input from which it was derived is a C<sub>1</sub>V<sub>1</sub>C<sub>2</sub>V<sub>2</sub> structure that has the V<sub>1</sub> elided.

However, in child phonology, the CrV phonetic representation is further subjected to additional phonological processes to simplify the structure for easy pronunciation. The processes as occurred in child phonology are liquid vocalization (vowelization), epenthesis, reduplication, and deletion to break the surface consonant cluster in the sequence. These processes are highlighted in the following.

#### *Vocalization of [r] in CrV Structure in Child Phonology*

The phonological process of vocalization is a simplification phenomenon that substitutes a syllabic liquid for a vowel (Pollock 1991). The process is common in child phonology. Language acquisition researchers such as Hyman (1975), O'Grady, and Sook (2001: 331), among others have concluded that in the acquisition process, vowel sounds are developed earlier than consonants. Amoako (2020) affirms this conclusion in the context of Akan. Thus, vocalization and its popularity in child phonology probably originate from the early acquisition of vowels ahead of consonants especially liquids. The Akan situation of language acquisition and child phonology is not exempted from the frequent vocalization that occurs in other languages.

In this regard, vocalization is prevalent in the phonetic realization of a CrV structure where the liquid [r] occurring word medially is vocalized. The output of this vocalization is the conversion of the CrV to a CVV sequence in the surface form in child phonology. This breaks the surface consonant cluster and simplifies the string for child articulation. The following examples (7) indicate the occurrence of vocalization in Akan child phonology.

(7)	Input	Adult Form	Structure	Child Form	Structure	Gloss	Child Age
i.	bira	bra	Cr.V	bɪa	CV.V	'to come'	3yrs 2months
ii.	pɪra	pɪra	Cr.V	pɪa	CV.V	'to sweep'	3yrs 3months
iii.	tira	tra	Cr.V	tɪa	CV.V	'to skip'	3yrs
iv.	ɔkɪra	ɔkɪra	V.Cr.V	ɔkɪa	V.CV.V	'a cat'	2yrs 8months
v.	ɔbɪrɛ	ɔbɪrɛ	V.Cr.V	ɔbɪɛ	V.CV.V	'fatigue'	2yrs 9months
vi.	mɪfɪrama	mɪfɪrama	C.Cr.V.CV	mɪfɪama	C.CV.V.CV	'air'	3yrs 5months

It is obvious in data (7) that the string of consonant clusters in input CrV in adult phonetic representation is simplified in child phonology for easy pronunciation. That is, adult phonology begins from the CV.CV as the input while child phonology in imitation of adult form applies to adopt CrV as the input. Therefore, to reduce the complex /Cr/ consonant cluster in child phonology, the liquid /r/ loses its [+Consonantal] feature and becomes [-Consonantal] through vocalization. The ensuing string is therefore rendered as a CV, which is a very familiar syllable structure in child phonology especially when the consonant in the CV is a stop as in (7i- v).

However, examining the CrV structure from the underlying CV.CV representation as in [bira, pɪra, ɔkɪra] argued in Marfo & Yankson (2008), it appears the liquid deletes without a replacement. This perspective is also possible from the level of phonological representation (PR). That is, the other implication is that, unlike in adult phonology, it is rather the underlying intervocalic liquid that is targeted for deletion from the PR to the phonetic form in child phonology. The effect of both analogies therefore is that syllable deletion is another effective syllable simplification strategy particularly on polysyllabic words in child phonology. Consequently, the phonological process of deletion in Akan child phonology is discussed below.

#### *Syllable Deletion in Child Phonology*

Aside from vocalization, another pervasive phonological process in child phonology is the deletion of an entire syllable unit. The most commonly affected unit is the weak syllable in polysyllabic words. The deletion is either to get rid of the challenging part or to truncate an extensive lexical item for easy pronunciation. The deletion of a weak syllable fewer impacts the structure of the lexical item. In Akan, the weak syllable is likely an initial syllabic consonant or a final syllabic consonant. Again, it could also be an initial or final vowel as well. Ingram (2008) accounting for the reasons for a syllable truncation, states that a syllable could be deleted because a constituent of that syllable is underdeveloped or non-existing in the phonology of the child. It is either of the aforementioned reasons that enforce syllable deletion in child phonology as illustrated in the example (8) below.

(8) Adult Form	Structure	Child Form	Structure	Gloss	Child Age
i. <u>mmiri</u> ka	C.CV.CV.CV	mita	CV.V.CV	'to run'	2yrs 7months
ii. <u>ahuru</u> si	V.CV.CV.CV	ahuti	V.CV.CV	'jubilation'	3yrs 1month
iii. <u>aduro</u>	V.CV. CV	edu	V.CV	'medicine'	2yrs 4months
iv. <u>paan</u> uu	CV.V.CV. V	anuu	V.CV.V	'bread'	2yrs 6months
v. <u>mpabu</u> a	C. CV.CV.V	pabua	CV.CV.V	'footwear'	3yrs 3months
vii. <u>okom</u>	V.CV. C	om	V.C	'hunger'	2yrs 3months

The data above illustrates the point that polysyllabic words are often simplified through the deletion of difficult syllables. The syllable to be deleted has no fixed position. For instance, in example (8i), the initial nasal syllable [m] together with the medial syllable [ri] are deleted to shorten the word for easy articulation. The initial syllable is probably deleted to break down the fictitious consonant cluster as in example (8v). But the deletion of the medial syllable and the final syllable in example (8i-iii, vi) is likely due to the gestural complexity in articulating the alveolar [r] and the velar [k]. In this regard, [k] and [s] are replaced with [t] as in (8i, ii) and [p] for [f] in (8v). In a nutshell, simplification through syllable deletion and substitution enhances production in child phonology.

#### *Reduplication in Akan Child Phonology*

In addition to the above simplification processes, reduplication is also another mitigation strategy through which children replace sophisticated syllables or units in a word with a relatively easier and convenient part of the base. The repeated unit or the reduplicant (RED) is usually a complete or partial copy of an existing base. In other words, reduplication in child phonology repeats part or a whole of a base as a replacement for a complex syllable or unit. Reduplication in child language encompasses deletion because it deletes and replaces by copying a part or a whole of the base to replace the vacuum created. The aim is to avoid the challenging unit in the base. The repeated part of the base is in a sense a substitute for the deleted sophisticated portion. Thus, reduplication in child language is not a morphological process to derive new words but a simplification strategy. With respect to the direction of reduplication in child language, there is a tendency that the copying and subsequent repetition could be progressive or regressive depending on where the child finds a convenient unit. That is, the reduplicant can be copied either from the right to the left or from the left to the right of the base. Though reduplication as a simplification strategy in Akan child phonology is sporadic and not pervasive as a substitution. Example (9) below shows the said process.

(9)	Adult Form	Structure	Child Form	Structure	Gloss	Child Age
i.	<u>okramai</u>	V.CrV.CV.V	mamai	CV.V.CV.V	'a dog'	3yrs 2months
ii.	<u>krataa</u>	CrV.CV.V	taataa	CV.V.CV.V	'a sheet'	2-5months
iii.	<u>abenkwai</u>	V.CV.C.CV.V	abenben	V.CV.C.CV.C	'palmnut soup'	2-10months
iv.	<u>teirefua</u>	CV.CV.CV.V	fuefua	CV.V.CV.CV	'an egg'	3-11months
v.	<u>bofuroti</u>	CV.CV.CV.CV	boboti	CV.CV.CV	'doughnut'	2-9months
vi.	<u>aburobe</u>	V.CV.CV.CV	abebe	V.CV.CV	'pineapple'	3yrs
vii.	<u>bisikiti</u>	CV.CV.CV.CV	kiki/bibiti	CV.CV.CV	'biscuit'	2-7months
viii.	<u>ahuma</u>	V.CV.CV	amama	V.CV.CV	'a rope/ thread'	3yrs 1month

All the above expressions in the child form contain a reduplication of the base. For instance, from the phonetic representation in example (9i, ii, viii), the final CV.V and CV of the base are copied regressively (right to left) to replace the challenging CrV structure in the initial position for (9i, ii). This results in the deletion of the complex CrV structure in (9i, ii) and it is replaced with the remaining CV.V reduplicant which is familiar and convenient in Akan child phonology. In the course of the simplification, the nominal vowel prefix in example (9i) is also dropped as a weak syllable. The final output is a partial regressive reduplication in the child form. However, in example (9iii, vii) the same process is carried out progressively. In this context, the complex syllable or unit appears at the suffix or final position of the base for (9iii) and at the medial position for (9vii). Hence, the medial CV.C and initial CV syllable of (iii, vii) respectively is progressively copied to replace the complex structure at the right of the base. In example (9iv, vi) the child copies and randomly select familiar segments from the base. The copied or randomly selected segments of the base are repositioned as a modified reduplicant. The process of reduplication in child phonology either shortens the number of syllables in the adult form or retains them. Nevertheless, unfamiliar unit(s) are deleted and replaced with the familiar unit(s) as repeated reduplicants copied from any part of the base.

## Conclusion

This paper discussed various phonological processes employed in Akan child phonology. It was observed that the Akan language has its inherent natural phonological processes such as palatalization, stridentization among others that are superimposed on its phonotactics and the building of larger constituents. However, the study noted that in the acquisition of child language, the segmental inventory and the inherent processes are acquired not as a spontaneous composite whole but chronologically. Moreover, vowels

are part of the early attained articulatory ability whereas stops are acquired before fricatives and affricates cross-linguistically with respect to manner. Therefore, in the course of the mastery, the speech and phonology of the child are characterized with other phonological processes as adopted by the 2-7-year-old child to simplify complex unattained articulatory competencies. As elaborated in the discussion, some of these synthetic phonological processes include the substitution of one segment for the other while others are syllable simplification strategies to afford the child some ease in production. The study gathered that in the Akan child phonology, substitution processes are dominant. In this respect, fricatives are replaced with stops in this pattern [s] > [t], [f] > [p] or [b], and other non stops such as [ɖʒ] > [d], [tɕ] > [t] under the process of stopping (plosivisation). With the phonological process of velar fronting, velar segments such as [k, g] are fronted in the pattern of [k] > [t], [g] > [d] as a product of velar fronting in Akan child phonology. Also, in child language, stridents or affricates such as [tɕ, ɖʒ, ɕ, ɖ, ts, dz] are probably de-affricated to surface as [t, d, h, g, h, k, t, d] respectively under the process of de-stridentization or de-palatalization. All these processes are adopted in child phonology as a simplification strategy for complex segments. Finally, with regard to syllable structure processes in child phonology, complex consonant clusters such as the CrV structure is subjected to vocalization in order to attain simple CV or V syllable familiar to the child. Aside from vocalization, other complex structures are either deleted as of a weak syllable or reduplicated to get rid of the complex structure and replace them with a relatively easier unit copied from the base.

## References

- Abakah, Emmanuel Nicholas. 2013. "Vowel Replacement Pattern in the Mfantse Dialect of Akan." *Journal of Universal Languages*, 14 (2): 7-51.
- Abakah, Emmanuel Nicholas. 2012. "Some Assimilatory Processes in Akan." *Journal of West African Languages* 39 (2): 47-82.
- Abakah, Emmanuel Nicholas. 2006. "Where have all the consonantal phonemes of Akan gone?" *Journal of Philosophy and Culture* 1(2): 21-48.
- Abakah, Emmanuel Nicholas. 2004. "Elision in Fante." *Africa & Asia* (4): 181-213.
- Abakah, Emmanuel Nicholas. 2002. "Remarks on the Akan Vocalic Inventory." *New Directions in Ghanaian Linguistics: Essays in Honour of the 3Ds*, edited by Felix K. Ameka & Emmanuel K. Osam, 243-263. Accra: Black Mask.
- Abakah, Emmanuel Nicholas. 1978. *Dialect Differences Between Iguae Mfantse and Bɔ̃rɔ̃r (Nkusukum) Mfantse*. Accra: University of Ghana, Legon BA Long essay.
- Adeniyi, Kolawole. & Adeniyi, Tulolupe. 2017. "Consonant sequence reduction in child phonology." *Ghana Journal of Linguistics* 6(1): 22- 48.

- Adjei, Adzo Francisca. 2002. *The study of the linguistic development of four pre-school Ewe speaking children: The emergence of phonology*. Accra: University of Ghana MPhil dissertation.
- Adomako, Kwasi. 2018a. *The phonology of Akan Loanwords in Ga and Dangme*. Accra: University of Ghana, Legon PhD dissertation.
- Adomako, Kwasi. 2018b. "Velar palatalization in Akan: a reconsideration." *Journal of West African Languages* 45 (2): 1-16.
- Adomako, Kwasi. 2017. "Morphophonological Analysis of Akan female family-name formation." *Ghana Journal of Linguistics* 6(3): 1-32.
- Adomako, Kwasi. 2015. "Some Phonological processes in an Akan linguistic game." *GEMA Online Journal of Language Studies* 72 (3): 3-22.
- Adomako, Kwasi. 2008. *Vowel epenthesis and consonant deletion in loanwords: A study of Akan*. Accra: University of Tromsø, Masters thesis.
- Agyekum, Kofi. 2004. "Indigenous education in Africa: Evidence from the Akan people of Ghana." *Journal of Cultural Transmission in the African World* 1 (2): 115-143.
- Akpanglo-Nartey, Jonas Nene. 2002. *An introduction to linguistic for non-native speakers of English*. Tema: Sakumo Books.
- Amoako, Wendy Kwakye. 2020. *Assessing phonological development among Akan speaking children*. British Columbia: University of British Columbia, Masters thesis.
- Baković, Eric. 2002. *Vowel harmony and stem identity*. New Jersey: Rutgers University, PhD dissertation.
- Bencivenga, Ermanno. 1987. "Economy of expression and the aesthetic pleasure." *Philosophy and Phenomenological Research* 47: 615- 630.
- Boadi, Lawrence Addai. 2014. "A minor historical rule of grave concern in the Volta-Comoe Languages." *Legon Journal of the Humanities* 25: 142-153.
- Boadi, Lawrence Addai. 2009. *A comparative phonological study of verbal affixes in seven Volta-Comoe languages*. Accra: Black Mask.
- Bresnan, John. 2001. *Lexical-functional syntax*. Oxford: Blackwell.
- Chan, Alice & Li, David. 2000. "English and Cantonese phonology in contrast: Explaining Cantonese ESL Learners English pronunciation." *Language, Culture and Curriculum* 13 (1): 67-85.
- Christaller, Johannes Gottlieb. 1933. *A dictionary of the Asante and Fante languages Called Tshi (Chwee, Twi)*. Basel: Evangelical Missionary Society.
- Clark, Ruth. 1982. "Theory and method in child –language research: Are we assuming too much." *Language Development* 1: 1-36.
- Clements, George Nicholas. 1984. "Vowel harmony in Akan: A consideration of Stewart's word structure conditions." *Studies in African Linguistics* 15: 321-337.
- Clements, George Nicholas. 1976. *Vowel harmony in nonlinear generative phonology: An autosegmental model*. (Ms) Harvard University: Cambridge, Mass.

- Clements, George Nicholas. 1981. *Akan Vowel Harmony: A Non-Linear Analysis*. Harvard Studies in Phonology 2. Bloomington: Indiana.
- Clement, George Nicholas & Hume, Elizabeth Valerie. 1995. "The internal organization of speech sounds." *The Handbook of Phonological Theory*, edited by John A. Goldsmith, 245-306. Oxford: Blackwell.
- Demuth, Katherine. 2003. "The acquisition of Bantu languages." *The Bantu languages*, edited by D. Nurse & G. Philippson, 209-220. London & New York: Routledge.
- Demuth, Katherine. 1993. "Issues in the acquisition of the Sesotho tonal system." *Child Language* 20: 275-301.
- Dolphyne, Florence Abena. 2006. *The Akan (Twi-Fante) language: Its sound systems and tonal structure*. Accra: Woeli Publishing Ltd.
- Eshun, Francis B. 1993. *Aspects of Akan phonology*. Madison: University of Wisconsin-Madison, PhD dissertation.
- Ewen, Collin J. & Hulst, Harry van der 2001. *The phonological structure of words: An introduction*. Cambridge: Cambridge University Press.
- Fee, Jane E. 2014. "Segments and syllables in early language acquisition. In Phonological acquisition in phonological theory." *Psychology Press* 43-62.
- Fromkin, Victoria. 1973. *Speech Errors as Linguistics Evidence*. The Hague: Mouton Publisher.
- Gussenhoven, Carlos & Jacobs, Haike. 1998. *Understanding phonology*. Oxford: Oxford University Press.
- Gxilise, Sandire. 2004. "The acquisition of clicks by Xhosa- speaking children." *Per Linguam* 20 (2): 1-12.
- Hyman, Larry M. 1975. *Phonology: theory and analysis*. University of Southern California.
- Ingram, D. 2008. "Cross linguistic phonological acquisition." *The Handbook of Clinical Linguistics*, edited by M. J. Ball, M. R. Perkins, N. Muller & S. Howard, 626-640. Malden, MA: Blackwell Publishing Ltd.
- Kaye, Jonathan. 1985. "On the syllable structure of certain West African Languages." *African Linguistics: Essays in Memory of M. W. K. Semikenke*, edited by D. L. Goyvaerts, 285-308. Amsterdam: John Benjamins.
- Kaye, Jonathan. 1982. "Harmony processes in Vata." *The structure of phonological representations* 2: 385-452.
- Kpogo, Felix. 2016. *Acquisition of co-articulated stops among Ga-speaking children*. Miami, Florida: Florida International University, MA dissertation.
- Kenstowicz, Michael J. 1994. *Phonology in generative grammar*. Cambridge, MA: Blackwell.
- Lord, Robert. 1974. *Comparative linguistics*. London: The English Universities Press.
- Lust, Barbara. 2006. *Child language acquisition and growth*. Cambridge: Cambridge University Press.

- Marfo, Charles & Yankson, Solace. 2008. "The structure of the CCV syllable of the Akan." *Concentric Studies in Linguistics* 34(2): 85-100.
- Mahanta, Shakuntala. 2007. *Directionality and locality in vowel harmony: With reference to vowel harmony in Assamese*. Utrecht: Utrecht University, PhD dissertation.
- Manyah, Kofi Adu. 2008. "On quantity and quality of oral and nasal vowels in Twi." *8th International Seminar on Speech Production*, 89-92.
- Mensah, E. N. A. 1987. "The feature lingual and the Akan consonant system." *Journal of West African Languages* 12 (1): 24- 33.
- Mowrer, D. E. & Burger, S. 1991. "A comparative analysis of phonological acquisition of consonants in the speech of 2- 6 year old Xhosa and English speaking children." *Clinical Linguistics and Phonetics* 5 (2): 19- 164.
- Nwokah, Evangeline. E. 1986. "Consonantal substitution patterns in Igbo phonological acquisition." *Language and Speech* 29 (2): 159-176.
- Odden, David. 1994. "Adjacency Parameters in Phonology." *Language* 70: 289- 330.
- Odoom, John. 2011. *Akan phonology for tertiary institutions & colleges*. Agona Swedru: Uthman Publications.
- O'Grady, William. & Sook, Whan Cho. 2001. "First language acquisition." *Contemporary linguistics: An introduction*, edited by W. O'Grady, J. Archibald, M. Arono & J. Rees-Miller, 409-448. Boston: Bedford/St. Martin's.
- Olawsky, Knut J. 1999. *Aspects of Dagbani grammar: with special emphasis on phonology and morphology*. Munich: LINCOM Europa.
- Oyebade, Francis. 1998. *A Course in Phonology*. Ijebu Ode: Shebiotimo Publications.
- Oyebade, Francis. 1990. "Language acquisition: The phonology of a Yoruba child." *Research in African Languages and Linguistics* 1: 17 -34.
- Pascoe, Michelle & Jeggo, Zenia. 2019. "Speech acquisition in monolingual children acquiring Zulu in rural KwaZulu-Natal, South Africa." *Journal of Monolingual and Bilingual Speech* 1 (1): 94-117.
- Pavlik, Radoslav. 2009. "A typology of assimilations." *SKASE Journal of Theoretical Linguistics* 6 (1): 2-26.
- Peters, Ann M. 1983. *The unit of language acquisition (Vol. 1)*. Cambridge: Cambridge University Press.
- Pollock, Karren E. 1991. "The identification of vowel errors using traditional articulation or phonological process test stimuli." *Language, Speech, and Hearing Services in Schools* 22 (2): 39-50.
- Rose, Yvan. 2009. "Internal and external influences on child productions." *Approaches to phonological complexity*, edited by F. Pellegrino, E. Marsico, I. Chitoran & C. Coupe, 329-35. Berlin: Mouton de Gruyter.
- Rose, Yan 2002. "Relations between segmental and prosodic structure in first language acquisition." *The Annual Review of Language Acquisition*, edited by L. Santelman, M. Verrips & F. Wijnen, 117- 155. Amsterdam: John Benjamins.

- Saah, Kofi Korankye. 1994. *Studies in Akan syntax, acquisition and sentence processing*. Ottawa: University of Ottawa, PhD dissertation.
- Schachter, Paul. 1962. *Teaching English to the Twi Speaker*. Oxford: Oxford University Press.
- Schachter, Paul & Fromkin, Victoria. 1968. "A phonology of Akan: Akuapem, Asante and Fante." *Working Papers in Phonetic No. 9*. University of California, Los Angeles.
- Stemberger, Joseph Paul & Bernhardt, Barbara May 2018. "Tap and trill clusters in typical and protracted phonological development: Challenging segments in complex phonological environment. Introduction to the special issue." *Clinical Linguistics and Phonetics* 32 (5- 6): 411-423.
- So, Lydia K. H. & Dodd, Barbara. 1995. "The acquisition of phonology by Cantonese speaking children." *Journal of Child Language* 22(3): 473-495.
- Stewart, John M. 1967. "Tongue Root Position in Akan Vowel Harmony." *Phonetica* 16: 185-204.
- Suzman, James. 1991. *Language acquisition in Zulu*. Johannesburg: Witwatersrand University, PhD dissertation.
- Wei, Xueping. 2008. "Implication of IL fossilization in second language acquisition." *English Language Teaching* 1 (1): 127-131.
- Williamson, G. 2010. "Phonological processes." Retrieved <http://www.Speech-therapy-information-and-resources.com/phonological-processes.html>.
- Younis, Idrees Umayya. 2008. "Substitution in child speech." *Buhuth Mustaqbaliya Scientific Periodical Journal* 4 (1): 35-56.