PHONOLOGICAL PROCESSES IN SELECTED NIGERIAN CHILDREN'S SPOKEN ENGLISH IN OYO AND LAGOS STATES, NIGERIA

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CERTIFICATION

I certify that this work was carried out by Ronke Eunice ADESOYE (Matric. No.: 143308) in the Department of English, University of Ibadan, Nigeria under my supervision.

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DEDICATION

I dedicate this research to the One who

moulds bones out of liquid

comprehends the unspoken words of infants, and

bestows on them the ability to acquire what adults learn

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ABSTRACT

Phonological processes constitute a veritable means to tracing language development, especially in children. Extant studies on Nigerian children's phonological processes have examined errors and deviations, with little attention to language as an instrument for measuring children's linguistic development. Therefore, this study was designed to examine children's phonological processes and the constraints ranking responsible for them, with a view to tracing their linguistic development.

Alan Prince and Paul Smolensky's Optimality Theory was used as the framework, while the descriptive design was adopted. One hundred and two participants were purposively selected. Seventy-five and twenty-five children from primary schools in Lagos and Oyo states, respectively, were selected because of their age range of four to six years, and they read a prepared text. The choice of the states was motivated by their proximal, cosmopolitan and multicultural features. Also, two children, named child A, aged one year-three months, and child B, aged four years-three months, were observed in their homes in Oyo and Lagos states, respectively, for six months for the purpose of longitudinal observation. All utterances were audio-recorded. Data were subjected to descriptive statistics, perceptual and acoustic analyses.

The phonological processes identified were substitution (28.8%), vowel strengthening (23.2%), monophthongisation (15.7%), deletion (15.4%), assimilation (6.6%), gliding (4.3%) and yod coalescence (2.7%). Utterances were slow-paced, with an average of 4.8 minutes per participant, and phonemes were often singly produced. Constraints ranking favoured markedness over faithfulness constraints, such as *SCHWA >> αF, NODIPHTHONG >> MAX, *Ct#C >> *COMPLEX >> MAX and AGREE(PLACE) >> IDENT-IO. The participants' linguistic development was noticeable in the instantiations of their processes, which were similar to the ambient variety of Nigerian English. The instances were very intelligible and significantly manifested beyond word level. They were also functional for achieving juncture prosody, cluster reduction and gemination. However, non-adult instances, like morphophonemic deletions, persisted, showing that the participants had not fully attained the adult level of phonological processes. In the longitudinal data, child A acquired voiced and labial consonants first, and codas suffered deletion more than onsets in monosyllables. By age two, child A had begun to produce polysyllables and closed syllables, and deletion changed from whole syllables to only phonemes. By age five, child B's processes had begun to resemble adults' and, more energy-demanding processes like epenthesis, voicing and vowel strengthening emerged. Tonalisation of English words and indigenous interference occurred in their utterances. The spectrogram showed that the outset of acquisition with child A featured weaker energy, like in unaspirated plosives; however, energy increased and stabilised as the participant got older, as indicated in the darker shades. The formant values of the participants' vowels on the acoustic chart showed similarity to the cardinal vowel chart in terms of height and position of the tongue.

Phonological processes in Nigerian children's spoken English emerged through constraints reranking and increasingly become more like adults' as the years pass by.

Keywords: Linguistic development, Language acquisition, Nigerian children's English

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF TABLEAUX

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Children often undergo rapid development, especially in the earliest years of life. Understanding how this development occurs can be very instrumental to identifying stunted growth very early. Child development entails the different changes that children undergo between infancy and teen age. These changes can be described using at least five domains, and these are cognitive skills, language skills, motor skills, socio-emotional skills and executive functions. The cognitive skills relate to thought processes and memory; the socio-emotional skills are connected with relationships, self-identity and empathy. The motor skill involves when and how well the child learns to sit, walk, run, jump, climb and so on. Executive functions refer to how a child deals with a novel challenge. The language skill involves children's production and comprehension of words (Fernald, Kariger, Engle and Raikes, 2009).

In developed countries, these five domains are jointly used to follow the progress of children's development. However, in developing countries, Fernald, et al. (2009) submit that the height of children has been the major yardstick for this description. Wells and Stackhouse (2016) also note that there is a dearth of child language studies that focus on language skills as a domain of development in Africa. This claim is further corroborated by Akanbi and Anyarsor (2014) who add that growth monitoring has been advocated by the World Health Organization (WHO) and United Nations International Children Emergency Funds (UNICEF) because of the high mortality rate of under-five-year-old children in the African region.

Rather than tackle this problem holistically using the different domains, many Nigerian hospitals and clinics focus mainly on motor skills and physical development while the internal manifestations are neglected (Popoola and Adeoti 2016). Hence, other domains of

development receive less attention. Although this is not what obtains in the country, Fernald, Kariger, Engle and Raikes (2009) posit that these multiple domains need to be jointly investigated to capture a wider spectrum of children's development and abilities. For instance, if a child experienced a setback in language development, such child would be negatively affected in the cognition and socio-emotional domains also, because these other domains require some level of language skill. Hence, the cognition and socio-emotional domains of such child would need to be examined too.

About the language domain specifically, Bowen (2011) states that children's language development is further broken down into four major aspects which are intelligibility, phonological development, phonetic development and phonotactic development. Intelligibility is the comprehension of what the children say as well as their comprehension of what is said to them. Phonological development refers to how speech sounds are mentally stored in the child's brain, how they are produced as well as the processes between these two phases. Phonetic development is the actual articulation of these sounds while phonotactic development involves the child's formation of words in the ambient language. However, some of Bowen's (2011) differentiations within a child's language development seem unnecessary as elements and processes of phonotactic development are already embedded within phonological development. Bowen (2011) adds that while children undergo these four aspects of language development, they engage in phonological processes – a process that children subject their speech to from infancy to about five years of age (Brown, 1973; Levelt, 2013).

Wells and Stackhouse (2016) opine that children under five years in low- and middle-income countries are not manifesting the expected features of growth, cognition or socio-economic development. Nigeria, alongside many other African countries, falls within this description. As a form of response to this challenge, a number of scholars, like Rossington (1981), Akanbi and Anyarsor (2014), Popoola and Adeoti (2016), Eze, Oguonu, Ojinnaka and Ibe (2017), and Jimoh, Anyiam and Yakubu (2018) have carried out child development-related research, from nutritional and medical perspectives, leaving the language domain lagging greatly in research and contribution to the description of child development in Nigeria, particularly in the area of phonology.

This is not to say that there are no phonological studies on Nigerian children. There are such studies as Akpan (2006), Ambrose (2010), Alerechi (2011), Onwubiko (2011), Dopemu (2015), Ibrahim and Ibrahim (2016), Adeniyi and Adeniyi (2017), Olarewaju (2018), Ademola-Adeoye (2019), Olarewaju and Sunday (2020), and Sunday and Olarewaju (2020) which focus particularly on the phonology of Nigerian children as they acquire their indigenous languages and/or the English language. These studies have advertently contributed to the literature on child language acquisition in Nigeria.

1.2 Statement of the problem

The basic domains for describing child development have already been established and the under-investigation of the language domain, especially in low- and middle-income countries like Nigeria has been recognised (Fernald, et al., 2009; Wells and Stackhouse, 2016). The advocacy for growth monitoring by WHO, UNICEF and other concerned bodies as a result of the high mortality rate of under-five-year-old children in Africa has mainly been responded to by medical related research and investigations (Akanbi and Anyarsor, 2014; Popoola and Adeoti, 2016; Eze, Oguonu, Ojinnaka and Ibe, 2017; Jimoh, Anyiam and Yakubu, 2018; Rossington, 1981).

Thus, the language domain of child development is still lagging (Wells and Stackhouse, 2016), despite the available phonological studies on Nigerian children's language acquisition like Akpan (2006), Ambrose (2010), Onwubiko (2011), Dopemu (2015), Adeniyi and Adeniyi (2017), Olarewaju (2018), Olarewaju and Sunday (2020), and Sunday and Olarewaju (2020). This is because while these studies investigate children's phonology, they have not done so from the perspective of describing children's development. Hence, there is a dire need for a kind of research that will investigate children's language acquisition with the purpose of describing their development.

So far also, the available literature used in clinical phonological investigation of children is based on British and American children's language use (Rella 1989; Ball 2016; Bowen 2011), hence, there is a need to investigate and document Nigerian children's early language use for this purpose. Therefore, this study investigates the language domain of child development through a focus on the phonological processes that accompany language acquisition within the first six years of life in one hundred and two Nigerian children.

Specific attention is paid to phonology because it is generally the first phase of language acquisition process in a child (Ball, 2016; Bowen, 2011). Prince and Smolensky's (1993) Optimality Theory is adopted as theoretical framework.

1.3 Aim and objectives

The aim of this study is to investigate the phonological processes of Nigerian children's English as means of tracing their language development and the objectives are:

1. to identify the phonological processes in the children's English language use;
2. to determine the constraints ranking for the emergence of these processes; and
3. to describe the children's language development.

1.4 Scope of the study

This study examined the phonological processes of selected Nigerian children in Lagos and Oyo States. Data were elicited from the children using an adopted text and through observation. Children between the ages of one and six years were observed. A total of one hundred and two children, comprising boys and girls, were participants in the research. The following processes were tested: yod coalescence, assimilation, deletion, monophthongisation, vowel strengthening, substitution, and gliding.

1.5 Significance of the study

The study is especially important because it is in the area of phonology which has been identified as the most challenging for second language users and the most evasive to describe for linguists. This study is an attempt to contribute to bringing structure and standard to this seemingly evasive level of language, especially regarding children's use.

More importantly, this study contributes to child and developmental linguistics in Nigeria. It does this by providing important database to help describe the language of typically developing children; this description can be used as a milestone for providing therapy to children with speech delays. This can be done by ensuring that findings from this study are available to speech therapists that specialise in English as spoken by Nigerian children.

More specifically, this study is very instrumental to the activities of rehabilitation centres, speech therapy clinics and concerned parents and guardians. This is because it presents information about the specific expected language progress of a Nigerian child.

Finally, this research is also significant because of its examination of phonological processes, a branch of suprasegmental phonology. Phonological processes are a further proof that language use is not a mere physiological activity but a psychological one which can only be adequately investigated using mental-oriented theories and tools of analysis.

1.6 Summary

This first chapter of the study has presented an introduction to the research. It contains the background to the study, the research problem, the aim and objectives, the scope, and the significance of the study. The next chapter contains a review of conceptual and empirical literature, as well as a review of the theoretical framework.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.0 Preamble

This chapter focuses on the conceptual and empirical literature that provide relevant context to the present study. These are language acquisition studies, psycholinguistics, phonological processes, Optimality Theory, germane empirical studies and the International Phonetic Alphabet.

2.1 Conceptual review

2.1.1 Language acquisition

Language acquisition is a process through which children develop the ability to understand and speak a language. It is a subconscious process that requires no active effort from the child before acquisition is achieved (Sureshkumar, 2002). Campbell and Wales (1970) describe language acquisition as the process through which children achieve a confident control of their native language. This description however, does not capture all contexts of language acquisition, especially some contemporary second language environments of the English language, where non-English children acquire English, or some variety of it, as their first language but do not have native-like competence.

This context nullifies Campbell and Wales' (1970) definition because the authenticity of the situation is undeniable in many second language environments. This contradictory situation described in this definition engenders two important facts which are, first, it is not only native languages that are acquired, rather, languages that are not culturally native or indigenous to a people can also be acquired by their offspring. Second, acquisition of a (first) language, especially one that is not native to the person, does not always feature native-like competence.

Furthermore, it is necessary to make a distinction between language acquisition and language learning. Language acquisition is different from language learning because the former is subconsciously carried out when children are still quite unaware while the latter is a conscious activity and is always a product of some form of formal learning as taught by someone or as self-taught (Kramiņa, 2000).

These descriptions provoke two germane questions regarding English as spoken as first language by some Nigerian children. Should it be considered to be a mother tongue? Also, is it acquired or learnt? In response to these questions, insight is drawn from Kroon (2003) which proffers three intertwined definitions of mother tongue. The first is that a mother tongue is one's native language which one speaks with one's parents and/or guardians in the home. The second description is from the perspective of politics and language policies where a language is deliberately chosen or created to suit the purposes of a mother tongue. Finally, Kroon (2003) describes mother tongue as the official and standard language variety that is used as the language of instruction in schools.

These descriptions give additional perspectives to the general and more widely known definition that a mother tongue is only one's indigenous language. Therefore, these descriptions provide an answer to the first question and that is the fact that English in Nigeria can qualify to be called a mother tongue among some families who use only English as the medium of communication. This situation is not peculiar to Nigeria alone because Shaeffer (2020) also notes that in Asia and some other regions, the younger generations speak a different language from their parents' and grandparents' generations, so that the language the parents grew up speaking is different from the language that their children grew up with.

In response to the second question raised about whether Nigerian children acquire or learn English as their first language, the answer to this question is not absolute and this is mainly because of the educational style that is generally upheld in Nigeria. From the very early age of two years, children are already enrolled in crèche and Montessori schools where they are exposed to some level of formal teaching and language learning. However, this cannot be said to account for all the language command that the children possess because English is

also spoken in their homes. Therefore, it appears that a good number of Nigerian children simultaneously learn and acquire English as their first language.

Zaščerinska (2010) argues that foreign languages are always consciously learnt while native languages are subconsciously acquired, however, this definition seems too absolute as there are now second language contexts that make this description problematic. Thus, the liberal and synonymous usage of both language acquisition and language learning by scholars like Sureshkumar (2002) should not be acceptable. Therefore, in the course of this research, language acquisition, which enjoys the focus of the research, is used to refer to the subconscious process through which children imbibe the ability to comprehend a language and express themselves in it.

2.1.2 Language acquisition studies

Studies in child language acquisition began towards the end of the nineteenth century and it started with parents who kept diaries of their children's language development. These diaries were known as parental diaries or "baby biographies". More advanced research emerged as years went by and, based on their peculiarities, these studies have been divided into three – diary, large sample and longitudinal studies. Matthews (1996) and Salim and Mehawesh (2014) provide similar reports of this history and delineation. These are presented in a tabular form below:

Table 2.1 History of child language studies

S/N	Phase	Matthews (1996)	Salim and Mehawesh (2014)
1	Diary studies	1877 – 1930	1876 – 1926
2	Large sample studies	1930 – 1957	1926 – 1957
3	Longitudinal studies	1957 until now	1957 until now

(Author's Conception, 2021)

The delineation in Table 2.1 shows the progression of child language acquisition studies. First is the examination of a single child's language development, whether by its parent(s) or a linguist; second is a study of a large group of children which provides more data to draw conclusions from. The third is a combination of the first two and it involves an observation of a much smaller group of children for a long period of time. The third mode of research provides a better opportunity for linguists to draw more robust and specific conclusions on research objectives. Longitudinal studies are essential because they provide a better opportunity to explore the process of language acquisition – a process that has defied wholesome understanding for many years. A major part of the studies in the 1870s focused on the earliest stage of language development because it was thought that this stage has more information about the origin of communicative competence (Matthews, 1996; Salim and Mehawesh, 2014). Findings are notably consistent across these investigations; one of these is that children's first words are about things that fascinate them (Rice, 1989).

There have been various attempts at explaining the procedure for language acquisition in children and these have yielded different theories. Some notable ones are discussed briefly in the subsequent paragraphs.

2.1.3 Theories of language acquisition

Some of the key theories within the discipline of child language acquisition are behaviourism, nativism, cognitivism, and socio-interactionism.

Behaviourism

Behaviourism is a movement in the field of psychology that was prevalent between the 1920s and the 1950s (Field, 2004). John Watson and B.F. Skinner held the view that there can only be speculations about the workings of the human brain, and that these speculations can be based only on the external activities and behaviour that humans display. This movement holds strongly that human thought-processes depend largely on language and is a sub-vocal aspect of speech itself. It also perceives language acquisition as a set of habits which a child imitates from the parents and for which such child is rewarded.

Skinner, a prominent figure in the theory of behaviourism, proposes that acquiring a language has to do with linking an external stimulus to a person's response. An instance of learning is the classical conditioning in which a person's response is linked to a particular stimulus. Another learning strategy proposed by Skinner is the operant conditioning where rewards are used to reinforce or reward responses. Being convinced by this, Skinner (1957) asserts that children are able to acquire language by imitating adults' utterances. Hence, parents provide the basis for imitation and encourage the children by correcting their errors and rewarding their correctness.

> Grammar is said to develop in the form of sentence frames into which words or phrases can be inserted. A process of 'chaining' accounts for the way in which words are organised in sequence, with the first word in the sentence providing a stimulus for the second, the second for the third and so on. This account considerably stretches what was originally understood by the terms 'stimulus' and 'reinforcement'.
>
> (Skinner, 1957: p. 31)

Field (2004) also notes Skinner's provision for some functions of the child's language use. Imitations are labelled as echoic utterances, while mands are the child's request for something. Tacts are the child's response to a non-verbal nudge and intraverbal responses have no syntactic link to verbal predecessors which engendered them.

Chomsky (1959) criticised Skinner's hypothesis of imitation being a medium of children's language acquisition. First, Chomsky counters that parents do not make the kind of mistakes that children make and neither do parents correct the grammar of their children. He notes that parents are more concerned about the correctness of the content of what the children say. Thus, behaviourism's central idea that language is a set of acquired habits is debunked by Chomsky. In contemporary research however, there is enough evidence to believe that imitation does have some role in a child's language acquisition process (Fernández and Cairn, 2011); hence, Chomsky's absolute refutation of the entire theory is considered premature. Also, Chomsky's conclusion that parents do not correct the language of their children is rather untrue especially considering a second language context, where parents correct their children's utterances.

Cognitivism

Cognitivism perceives language acquisition as intertwined with general cognition and cognitive development (Field, 2004). As a child grows in years, this cognitive perception gradually becomes better and more improved. Piaget (1970) established this concept more when he stated that language comes about as a result of cognition and perception.

In the same vein, Rice (1989) shows that cognitive and mental development prompt language acquisition. However, she counters Piaget's claim that cognition grows before language does, stating that both occur roughly simultaneously. For instance, toddlers are saying "all gone" at about the same time they are solving age-advanced tasks. She emphasises this when she says that "it is not the case that pre-linguistic conceptual knowledge always precedes and accounts for language development. Instead, the two domains seem to develop synchronously." (p.151)

Despite both researchers' convincing arguments however, only part of their submissions are verifiable and that is the aspect about language expression, while the other part about cognitive growth and development of children are largely subjective and subject to the physical but limited demonstrations of children. The internal workings and thought processes in the mind are still greatly undecipherable through theories and hypothesis, except through technological interventions.

Socio-Interactionism

Socio-Interactionism views language acquisition as a joint effort from the child's environment, the child's social instincts, pragmatic needs and relationship with the parents and/or caregivers. Proponents of this approach agree that there is an innate aspect to language acquisition but that this is not enough to explain the whole process. It is important to note that both linguistic and non-linguistic interactions are a result of the child's need to interact and communicate (Vygotsky, 1978).

Further, socio-interactionists argue that stimulus is not as impoverished as Chomksy claims. They assert that adults' self-correction, slow speech rate, increased intonation patterns, which are generally the features of motherese seem to help children understand

what is being communicated. This theory counters the assertion by nativism that children do not receive corrective feedback; the socio-interactionists put forward that corrective feedback is usually indirect – utterance recast, puzzlement, and grammatically correct responses.

This theory balances out claims from some other approaches by acknowledging the mental processes that are committed to a child's language acquisition process and also maintaining that the language spoken in the child's environment is equally important. A good instance of this is children who, for different reasons, were shut out of any form of social interaction in the early years of their lives and who could not understand or speak any human language as a result. These children have the same mental capacity that other children have; however, because they were not exposed to any language, they are neither able to speak nor understand a language. This goes to prove that the language from the environment is as important as the mental ability of a child.

Nativism

Nativism holds that language acquisition is genetically designed, that is, children are born with the innate ability to acquire language. Levelt (2013) lends support to nativism because of his conviction that since language shares certain key similarities with other behaviours, then it must be controlled by something that is innate (Field, 2004). Central to the nativist theory is the notion that children possess innate linguistic knowledge which makes them aware of the grammatical principles in a language. This knowledge is combined with the linguistic data which they receive as input from the adults around to help them complete the acquisition process of language within five years. However, this stance has been faulted by many researchers who counter "the universality of generative grammar, the autonomy of syntax in language processing, and the fundamental unlearnability of language" (Fernald and Marchman, 2006: p. 1030).

Crain and Lillo-Martin (1999) propose universal grammar as an alternative means to explain the acquisition of language by children. They make a distinction between linguistic performance and linguistic competence and base their theorisation on the latter which

focuses on the mental rules that determine language production, as against the former which is usually influenced by such speech factors like hesitation, distractions and the like.

The timeless question of how children really come to master language within a few years is answered by these scholars in the simple claim that children are configured to do so. They report Chomsky's earlier submission that the innate ability to master a language is embedded in the child's Language Acquisition Device (LAD); this enables them to have an unconscious possession of the universal features of language as well as the parameters and constraints of the language of their environment. Hence, as they acquire words from the input they receive, they map these words onto the existing principles they already have. This school of thought follows Chomsky's (1996) submission.

Crain and Lillo-Martin (1999) propose a schema that shows the progression from the primary linguistic data (PLD) to the language acquisition device and to the final state. This strict sequence shows the progression involved in language acquisition. First, a child is exposed to the language that adults speak around it; from this language, a child is able to gather the input for the acquisition process. This input is called the PLD; it is subjected to the child's innate ability for language learning which is embedded in the LAD. This continues to progressively work on the input the child has gathered until he attains the final stage which is the adult language. Below is the schema:

Input (PLD) → LAD → Final state (Crain and Lillo-Martin, 1999:5)

The possibility of a child learning a language without being taught or instructed is expressed in the notion of universality of language (Crain and Lillo-Martin, 1995) and this assertion is inseparable from Chomsky's submission on the Language Acquisition Device which is more recently addressed within Universal Grammar (Chomsky, 1996). This principle holds that typically developing children all across the world undergo the same stages of language acquisition. However, the age at which these stages occur may vary by months across children. Therefore, it is safer for language development to be described in stages instead of in ages. Although these stages are universal, there are factors that make one child's language acquisition process distinct from others. These factors are social, environmental, individual differences, and availability of PLD. Primary Linguistic Data could be directly

or indirectly presented through motherese or adult speech, explicit or implicit feedback may be provided, and there may be no feedback at all. Also, feedback may be either targeted at grammaticality or the truth-value of the child's utterance. Despite these possible variations throughout the stages of children's language acquisition, they are all able to subject PLD to LAD until they attain the final state. This typical achievement despite the peculiar colourations is what is referred to as universality of language (Crain and Lillo-Martin, 1999).

Fernández and Cairn (2011) also designed a figure which is very similar to the schema by Crain and Lillo-Martin (1995). This figure contains the essential components of the schema as well as the progression. Hence, the thematic content portrayed in both illustrations is the same and this is that the input is subjected to the LAD which in turn provides the output.

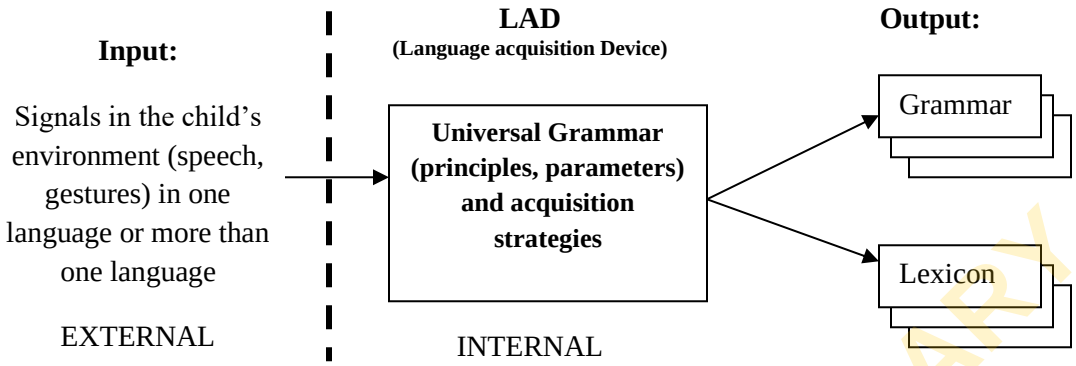


Fig. 2.1 Schematic diagram of the relationship between external stimuli and internal knowledge in language acquisition

Fernández, E. M. and Cairns, H. S. 2011. *Fundamentals of psycholinguistics*. New York: John Wiley and Sons.

Figure 2.1 shows the sequence of the processes involved in a child's language acquisition. Although the innate biological attribute of every human is present in the child already, it cannot solely give the child a language, in other words, the child still needs the input – the language, before the LAD is engaged. The grammar that the child develops encapsulates such sub-areas like phonological components, syntactic and morphological components. These become more sophisticated as the child matures in age and experience in the language.

Although children's eventual language command is partly a product of the environment, Crain and Lillo-Martin (1999) emphasise that the parents cannot be said to occupy a central position within this environmental factor. They cite an example of immigrant parents whose children master the language of the new environment, while they (parents) only struggle to attain the simple level of language command for basic purposes. Thus, with this, they prove that parents cannot be said to be the (only) language models for their children. Despite this limitation however, its impact on children should not be belittled.

By extension, language development among atypically developing children who have varying degrees of difficulties with language should also be described, not in terms of age but in terms of stages, stages which, in their case, will be greatly varied by many months, even years, depending on the severity of their challenge.

Towards a justification of the nativist theory of language acquisition, Crain and Lillo-Martin (1999) critique a series of mechanisms which have been previously submitted as basis for language acquisition. These are trial and error, corrective feedback, imitation, expansion and motherese.

1. **Trial and error:** Crain and Lillo-Martin (1999) debunk the trial and error mechanism because of the universal process of child language acquisition. This universality suggests that there is a system behind the process. In other words, if all children acquired language through a trial and error method, they would not share the same sequence. Also, the convergence on the same grammatical rules by children learning the same language is another proof that language is not acquired through trial. A further proof is that children make too few errors (in comparison with the totality of the possible errors in a language).

In concurrence with Crain and Lillo-Martin's submission, children's errors are quite systematic; hence, this nullifies the trial and error proposition. Apart from the criticisms presented by these authors, trial and error mechanism in itself presents a conscious and deliberate effort which is conspicuously absent in children at this stage.

2. **Corrective feedback (negative evidence):** There are objections to the notion that children's acquisition of language is as a result of the corrections they get from their parents and/or guardians. The research notes that parents are more concerned about the truth in children's language use than the grammar and that children do not always respond when adults attempt to correct their ungrammatical baby-talk. Fernández and Cairn (2011) state that although some parents tend to think that they are obliged to correct their children's ungrammatical expressions, majority of parents correct the content-accuracy of their children's expressions rather than the structure. They also observe that based on relevant research, correction by adults does not usually make much of a change in the language of children. This is because the children acquire a language on their own terms and in their natural phase and pace.

However, there is reason to debate this argument put forward by Fernández and Cairn (2011) because parents, especially in English as a second language context, care about their children's language as much as they do about the content. Therefore, parents, guardians and teachers in this clime correct their children and wards' language use right from when these children are able to understand. Thus, it is logical to submit that the native language context in which these scholars have carried out their research prompts them to overgeneralise that this is what obtains in other language contexts.

3. **Imitation:** Another popular notion is that children develop their language skills through imitation of adults' use of the same language. Crain and Lillo-Martin (1999) agree that there may be some iota of confidence in this claim, however, they argue that there must be more to the process of acquisition than just imitation. They buttress this argument with children's overregularisation of principles, culling an example from the addition of regular past tense morpheme (-ed) to irregular verbs, hence producing words like "goed" or "runned". They further note that this overregularisation continues in the children's language for months, sometimes years. In addition, Fernández and Cairn (2011) explain

that the extent of utterance imitation varies from child to child and that even those who imitate do not do it all of the time neither do they acquire language more quickly than those who do not imitate.

4. **Expansion:** When children use their short and simple forms of sentences, their parents and guardians often extend these into full-fledged sentences – this is called expansion; it may also be subsumed under motherese (Rice, 1989) but has been separated here to accommodate the ongoing review of the critique carried out by Crain and Lillo-Martin (1999). Expansion cannot be a core mechanism for language acquisition and there is an experimental research to prove this (Crain and Lillo-Martin, 1999). In this experiment, there were two groups of children, one group had adults expanding their utterances, while the adults in the other group did not expand the children's utterances. After the study, there was no improvement in the language of the experimental group relative to the control group. It is thus concluded that parents' expansion of their children's utterances does not contribute to the children's language development in any significant way.

This experiment records that that the difference recorded was insignificant, however, the term insignificant is really a relative and subjective term especially because no statistical analysis was provided. Also, it is already a fact that no single one of these mechanisms has a monotony of the language acquisition process, thus, it is necessary to record the impact, no matter how minimal, that each mechanism has on the entire process.

5. **Motherese:** This refers to adults' simplification of their language use so as to come down to the comprehension level of children. Its features include an emphasis on objects and people within their vicinity, that is, concrete reference to *here* and *now*, a limited vocabulary, a lot of paraphrasing and frequent repetitions, simple and well-formed sentences, and a slow speech rate with pauses between utterances and after content words. Other features include clearer articulation, higher pitch, use of full names instead of pronouns, and gestures to attract attention (Rice, 1989; Crain and Lillo-Martin, 1999; Duncan, 2013). Motherese also involves semantic contingency – a situation when the child mentions an item and the adult expands on it; this helps the children to expand their vocabulary. These features of motherese are not all universal, however, when used within the construct of a particular culture, it reflects how infants and young children are

addressed. Crain and Lillo-Martin (1999) submit that previous studies showed no significant difference between the use or otherwise of motherese with children. They add that simplifying language structure and its use only makes acquisition difficult for children. Fernández and Cairn (2011) corroborate this claim by stating that although infant-directed exaggerated prosody may help children distinguish the phonemes, words and phrasal boundaries of their language easily, without this assistance, they would have acquired these eventually. Also, the children spoken to in motherese do not acquire language faster than those who are not. Therefore, motherese cannot be the sole explanation for how children acquire language.

Although Fernández and Cairn (2011) establish that these discussed mechanisms (trial and error, corrective feedback, imitation , expansion, and motherese) are not very central to a child's language acquisition, they emphasise that input should not only be available, but should also be interactive. To corroborate this point, they cite Sachs, Bard and Johnson's (1981) study of two children of deaf parents – Jim and Glen. These children were unable to adequately acquire spoken language because their parents were incapacitated in this regard, and the only exposure to language they had was with the television which was non-interactive and therefore inadequate. However, after series of oral interaction with them, the language of the older child, Glen, got extremely better.

This then raises the question of what it really means for language use with children to be interactive, if not partly to expand their language use, involve the use of motherese, listen as children imitate, and correct them when they need it. These are major activities that culminate into the interaction that Fernández and Cairn's (2011) advocate for. In other words, Fernández and Cairn (2011) have under-acknowledged the impact of these mechanisms in children's language acquisition process. Since they have established the importance of an interactive Primary Linguistic Data, their critique of the above mechanisms seems myopic because these are what help the available linguistic data to be interactive.

Hence, the combination of expansion, motherese, corrective feedback and imitation are what really make language to be interactive for children's acquisition process. Therefore, it is safe to say that no single mechanism here is responsible for acquisition like Crain and

Lillo-Martin present; rather, it is an incorporation of them all. Therefore, this realisation faults the schema and diagrammatic illustrations that both studies have put forward because such factors like interaction and cognition are missing. Hence, there is a need for a revision of these presentations and the current study presents this below:

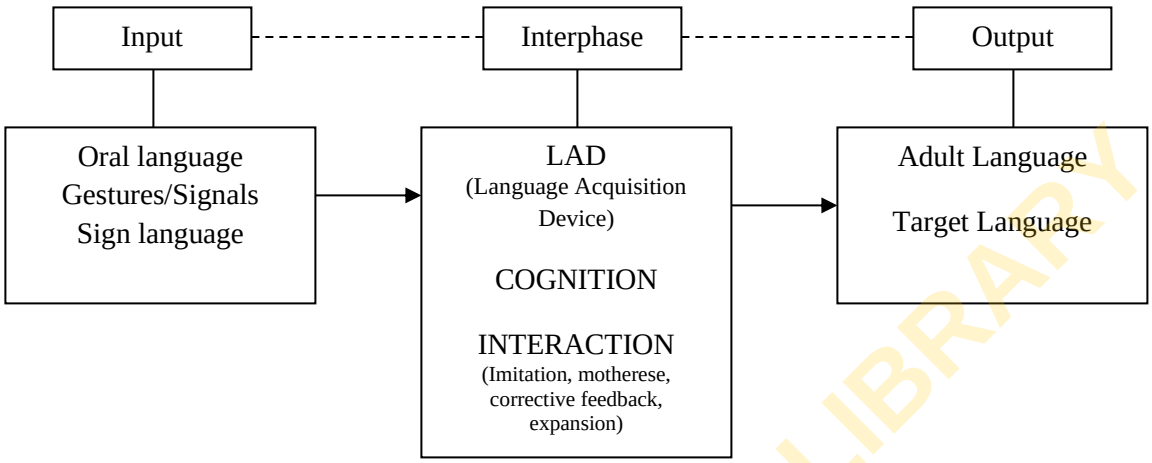


Fig. 2.2 Factor interactions in language acquisition

(Author's Conception, 2021)

Figure 2.2 has three phases which are the input, interphase and output. The input phase presents the language tokens that a child is exposed to from the very beginning of a language acquisition process. These language tokens could be oral or gestural, and they are made available when adults and older children use this language around them or when they watch the television and are exposed to some social media platform. This input phase does not capture written language because acquiring the ability to read written language involves a conscious effort from the child, thus, this skill is not captured in the figure above.

After a child is exposed to these language expressions, three different components come together in the interphase. These are cognition, interaction and LAD. Cognition involves their mental processes, interaction has to do with how the people around them engage this language with them, and the innate language acquisition device is the naturally endowed ability to acquire a language. All these are jointly manoeuvred to achieve the acquisition process.

This figure incorporates LAD, cognition and interaction in the interphase because Fernández and Cairn's (2011) "external" and "internal stimuli" were removed. This removal was necessitated by the difficulty in classifying "interaction" as either external or internal stimuli. Furthermore, the interaction factor was also expanded to accommodate imitation, motherese, corrective feedback and expansion which the previous schemas ignored. This accommodation is permitted because all the mechanisms contribute their quota to the overall achievement of acquisition. It also is noteworthy that although the varying theoretical approaches to language acquisition view the subject from different angles, they all agree on the fact that a child's cognitive domain works on an ambient language to achieve language acquisition.

The current study maintains a stance that is similar to that of socio-interactionism. It combines the mechanisms under the interaction and subsumes it within the interphase, along with cognition and LAD. This proposed theory is called a cogno-interactionist theory of language acquisition. This approach is so called because it draws on cognition, LAD and interaction as the core elements that describe the process of child language acquisition. The under-listed are the adopted tenets of this proposed approach:

1. A child's cognition is important to language acquisition and, as it grows, the cognition increases and so does comprehension and expression of language.
2. A child's language acquisition is propelled by its need to respond and interact with the society; hence, both linguistic and non-linguistic interactions stimulate language acquisition.
3. Continued exposure to interaction is important for a continued and progressive acquisition of language.
4. Children, especially before the age of five, are naturally endowed to understand language without being exactly taught.

None of the above listed items supersedes the others; each of them exists in dependence to the others and possesses equal importance. Children like Jim and Glen in Sachs, Bard and Johnson's (1981) study are proof that only having the innate ability to learn a language is not enough for language acquisition. Also, atypically developing children who suffer mental and/or physiological inabilities are proof that having a language being spoken around a child is not enough to acquire the language either. All the factors have to work together for a child to acquire a language adequately.

2.1.4 Logical problem of language acquisition (LPLA)

This problem simply refers to the question of how children are able to master language rapidly despite the limited experience they are exposed to in the early phase of life. In other words, it asks the fundamental question of how children are able to avoid the numerous potential ungrammaticalities in language use (Rice, 1989; Crain and Lillo-Martin, 1999; Hyams and Orfitelli, 2015). Logical problem of language acquisition has to do with how children come to know the inappropriate and improbable structures in their languages even when they are only exposed to the possible structures by the adults. How do they know what not to say and what is and is not correct? To answer this germane question, Crain and Lillo-Martin (1999) rely heavily on the principles of Universal Grammar.

Rice (1989) describes what Baker (1979) pointed out as three observations of this basic question:

1. there is no negative evidence available to children;

> 2. children tend to overgeneralize linguistic rules and make mistakes similar to the grammatical sentences…; and
> 3. finally, the constraints in a language are quite arbitrary and not readily predictable and thus seem not to be easily learnable
>
> p. 150

Rice's (1989) and, Hyams and Orfitelli's (2015) reference to this question shows that it is still as relevant in the 2000s as it was in 1980s. Rice (1989) further reveals that since children are unable to answer questions despite the manifestation of their expressive language skill within the first year, data for research has to be gathered from their utterances and what is said to them. In other words, researchers have to garner what they can out of what the children say since they cannot really directly answer questions when asked.

Another question that LPLA asks is whether or not children know how correct or incorrect their utterances are. The present answer to this question is negative. Children are not consciously aware to the extent of deliberately producing correct or incorrect structures. However, what has been established is that they are able to acquire words from what they hear around them and model their structures after them. This explains their overgeneralisations of certain rules. In answer to the logical problem of language acquisition, therefore, it is submitted that the children do not really *avoid* ungrammaticality, rather, they speak it as they hear, process it and arrive at ungrammaticalities which are modelled after the grammatical structures they hear.

2.1.5 The dilemma of the "how"

Rice (1989) states that the real research problem is finding out the process of how children extract from the language they hear and perceive the conventional linguistic rules of their native languages. The answers of cognitive and social underpinnings or innate linguistic devices only show the phases; they really do not answer the question of *how*. As of 1989 when her article was written, Rice says scholars have focused their energy on describing the children's linguistic abilities and patterns of acquisition but not really on how the language is acquired; three decades after, this question is still being asked and is yet to be adequately answered (Guolaugsdottir, 2016). Rice (1989) states that there is a clear answer to the question of how cognitive mechanisms help children resolve the learnability problem

or arrive at language-specific knowledge. She faults the linguistic models that support an innate linguistic learning device as not having satisfactorily specified how such device would work and how it interfaces with the rich network of general cognitive mechanisms available to even very young children. Resolution of these problems constitutes the most challenging of the current questions about language development.

Lust (2006) reiterates that "[l]anguage acquisition is an inherently intellectual feat in that children do complex theory construction. The growth of language is mediated in the human species by complex symbolic computation" (p. 1). Stork and Widdowson's (1974) innateness hypothesis corroborates this, and draws the following generalisations:

a. All human beings learn a language
b. All human languages are equally learnable
c. All human languages are different on the surface but all have certain underlying features in common, which account for their being "learnable"
d. These features which are universal to all human beings are the key to what is innate

From the review, it is evident that child language acquisition is still a research-worthy field as there are still questions that are in need of answers, especially regarding the specific activities that children undergo to acquire language by just listening. It has been established that there is a universal framework that makes acquiring language possible for children (Chomsky, 1996; Crain and Lillo-Martin, 1999; Fernández and Cairn, 2011). However, the question remains – what is the nature and structure of this universal framework?

Locke's (2009) study aptly provides a path to an answer for the salient question of *how* which is raised by Rice (1989), Lust (2007) and Guolaugsdottir (2016). Locke avers that unravelling this unknown from the angle of genetic studies has also been futile because genes do not work in isolation but require external signal which in this case is language. He argues the need for linguistics to situate language within an evolutionary and developmental framework to birth a new branch of linguistics – evolutionary development linguistics which can then merge the resources of language studies with that of evolutional development so that the exact process a child uses to acquire language can be unravelled. This suggestion is modelled after the merger of evolutionary biology and developmental biology in order to arrive at a richer understanding of the modifications of development as

well as its processes and production of new features. In other words, Locke (2009) calls for a joint effort between linguistics and evolutional development. He says:

> A new branch of linguistics, "Evolutionary Developmental Linguistics" (EDL), would be able to import findings from research in the other fields of cognitive and developmental neuroscience, and export theory and data to those fields. The result is almost certain to be a better understanding of language itself.
>
> (p. 36)

He further refers to Chomsky's description of language acquisition as a biological process. Therefore, if linguists who have made great headway in child language studies are able to combine their efforts with scholars in science fields, greater results would be achieved. In line with this, Matthews (1996) also expressed optimism about the future and potential of neural network models in the analysis of language. Therefore, Locke (2009) calls for linguists to exploit maximally, the potential in Evolutionary Developmental Linguistics so that scholars outside linguistics do not end up postulating theories in language studies.

As helpful as this suggestion is, the situation really is that there are already collaborations between linguistics and some disciplines of science like psychology, neurology, computer science, hence such areas like psycholinguistics, neurolinguistics and computational linguistics (Kager, 2003). He adds that it is the objective of linguistic disciplines to expound how the human mind processes linguistic knowledge and that this endeavour is not the direct responsibility of a formal theory. This opinion corroborates Locke's submission that linguistics needs to partner with other disciplines to achieve a more comprehensive understanding of language acquisition.

2.1.6 Psycholinguistics

There are quite a number of scholars who have tried to trace the history of psycholinguistics. Garnham, Garrod and Sanford (2006) state that psycholinguistics was recognised and established as a discipline around the end of the nineteenth century and that this development helped medicine record phenomenal growth. A seminal example of this

development is Broca's and Wernicke's original descriptions of aphasia which happened during this time. Also, Coleman (2013) traces the inception of psycholinguistics to the 1950s when an interdisciplinary seminar was organised in 1953. Levelt (2013) submits that the history of psycholinguistics can be traced back to 1762.

Psycholinguistics is an interdisciplinary exploration of language using the resources of psychology and linguistics. It examines the connection between linguistic behaviour and psychological processes, and the process through which language is acquired (Fernández and Cairns, 2011). Field (2006) asserts that this branch helps to unravel the connection between the human mind and language. It does this on an individual basis (although individuals share mental properties), then these studies are brought together in an attempt to figure out the correlating features, and how the human mind works. Hence, the norm is established primarily for the purpose of knowledge and to carry out more studies (Field, 2006).

Tanenhaus (1989) notes that psycholinguistics investigates three unique areas which are how language is acquired, how it is understood and how it is produced. Language acquisition is the focus of developmental psycholinguistics; language comprehension and production constitute the core of what is done within experimental psycholinguistics. Levelt (2013) also corroborates this classification of psycholinguistics into three sub-classes. However, Field (2006) identifies six areas which are central to psycholinguistics; these are language processing, language storage and access, comprehension theory, language and the brain, language in exceptional circumstances and first language acquisition. Although Field's (2006) classification appears to be more diverse, it still does not capture certain areas that may be considered central to psycholinguistics, for instance second language acquisition. Also, some of the classifications he makes could have been merged into the broader ones provided by Tanenhaus (1989) and Levelt (2013).

The area that is central to the current study is first language acquisition. This area of psycholinguistics attempts to solve the age-long puzzle of the entirety of stages that children undergo to eventually acquire their first language. Fernández and Cairns (2011) corroborate this by stating that psycholinguistics is geared towards comprehending the acquisition of language, its use and comprehension by different people and its

representation and processing in the human brain. They state that there is a direct link between psycholinguistics and some other disciplines like developmental psychology, cognitive psychology, neurolinguistics and speech science. Psycholinguistics draws heavily from theories in cognitive psychology but is somewhat limited in its use of experimental techniques unlike studies in second language acquisition (Field, 2006).

Levelt (2013) writes that evolutionary biologists, including Charles Darwin, theorised the phylogenetic development of speech in humans as well as the potential of innate recapitulation in ontogenesis. Simply, these scientists propose that language development in humans is in phases and stages. The psychologists perceived the ontogenesis of language as a sign that coginitive development was taking place; hence, a child's command of language was a phase of its developmental psychology. Over the course of various research in the area of psychology, it became central to find out how a child's expanding bank of sounds gets connected to pictures and abstract concepts. How does the child's word bank grow; how does it master the formation of words, their meanings and how they are used? These various inquisitions into child language acquisition worked differently until the late nineteenth century. However, while they worked differently, they had a common feature which was that many of these investigations were carried out by parents – diary studies, and this form of study still exists till now (Levelt, 2013).

Levelt's account of the history of psycholinguistics reveals the tussle for theoretical supremacy between empiricism and nativism for the explanation of how a child acquires language. However, he notes that there is more agreement than disagreement on this issue. The first area of agreement among the different researchers is the order in which children acquire sounds. It is usually preceded by the 'outer speech' and followed by the 'inner speech'. By the outer speech is meant the sounds which carry no semantic burden, while by the inner speech is the sounds which are combined to form words. The sequence of the activities between these phases is general among children, however, the timing differs greatly from child to child.

2.1.7 Stages of language acquisition

Language acquisition is in phases and each of the phases shares similarities with an adult's language use. Also, these phases are similar across languages and Chomsky (1959) shows that the principles applicable in the consecutive stages of these languages are universal. However, Rahimpour (2004) argues that this universality is only a possibility, not a certainty. This probability is evidenced in motherese which although is present in many languages, manifests differently in various cultures. The timing of language development in children may vary by months but, the events and stages themselves are general. Thus, the sequence of activities in the acquisition process is unmistakably consistent (Crain and Lillo-Martin 1999; Fernández and Cairn, 2011). This extensive similarity in the stages of children's language acquisition is a pointer to the fact that language has a biological predisposition to it, and that humans possess an innate skill which brings about the process of language acquisition (Fernández and Cairns, 2011).

In earlier studies of developmental psycholinguistics, Nelson (1977) revealed that attention was not paid to the sounds and gestures that a baby made until the first sentence was uttered. This was so because it was perceived that the sentence was the basic and only fundamental medium of communication. However, this claim has since been debunked as it has been discovered that babies express themselves and communicate even with their pre-verbal sounds. Before a child begins to produce the actual language, it first begins with interpretation and comprehension. In fact, a child exhibits comprehension earlier than it expresses itself (Crain and Lillo-Martin, 1999; Levelt, 2013; Salim and Mehawesh, 2014). For comprehension at the early stages, a child depends heavily on extra-linguistic cues to understand. In their second year of life, how quickly a child understands language use is a central indication of how well they will use the language. Nelson (1977) notes that "child language has its roots in the social communication system and in the individual cognitive system and both must be coordinated and matched to the language system of the community" (p. 571).

The mystery behind how a child acquires the syntax of their language is demystified when he states that a child uses the same learning strategies employed in other areas. The pertinent question here is: is it the same with phonology acquisition? However, as similar

as children's language acquisition processes are, their idiosyncrasies interfere and influence the outcome of the process (Nelson, 1977).

Children acquire sounds that are found in all languages first, afterwards, they learn those that are particular to their own languages (Szczegielniak, 1982; Crain and Lillo-Martin, 1999). Vowels are learnt and produced before consonants. Perhaps, this is the case because vowel phonemes are more easily produced since the major articulator needed is the tongue while the consonants need more articulators than just the tongue. According to Nelson (1977), the consonant acquisition is also usually ordered: for manner of articulation – "nasals, glides, stops, liquids, fricatives, affricates" while for place of articulation – "labials, velars, alveolars, and palatals" (p. 573). Szczegielniak (1982) corroborates more specifically that at this stage, children perceive more sounds than they produce and when they have some difficulty producing a particular sound, they replace it with another. The children do not carry out these replacements haphazardly, rather, they are rule-governed, although unconscious. However, these rules cannot be said to be universal. Also, consonant clusters are simplified, syllables are duplicated and final consonant phonemes are elided. Although, O'Grady and Choo's (2001) findings show that stops occur before other consonant sounds in manner of articulation, they agree that regarding the place of articulation of consonant phonemes, labials are produced first. However, it is important to be cautious about being rigid concerning the order in which these consonants occur among children, because first, the languages of the world do not all have the same set of phonemes, and second, children will acquire the easiest phonemes from the whole lot that they perceive around them.

Rice (1989) reports that among children, the early social functions of language show remarkable similarity but these functions are not universal. Although they produce words around the same time, and the same sort of meanings are encoded in early words and sentences, there are still variations at the individual level, in terms of rate and manner of acquisition, combination of words, choice of only content words or not and so forth. All this prove that a child's idiosyncrasy comes to fore when acquiring a language. From the beginning, children engage language as a social tool to seek attention, protest, greet, request, refute and so on. Hence, it is evident that they are socially and intellectually

motivated to acquire a language for their pre-linguistic communicative needs. The social setting validates the effectiveness of a child as a communicator – whether this communication is carried out with words or just sounds (cries), it is perceived and treated as meaningful.

Rahimpour (2004) identifies two important skills used to explain the development of language in children; these are the receptive skill and the expressive skill. The receptive skill often comes before the expressive skill because as soon as a child is born and begins to hear different noises and/or sounds, its receptive skill is already at work. The expressive skill is put to use when they begin to produce sounds for communication.

Fernández and Cairn (2011) break down language development in children to their ages and each of these classifications is discussed below.

1 Before birth

According to research (Hepper and Shahidullah, 1994; Graven and Browne, 2008), the hearing ability begins to develop in children from the second trimester at about eighteen weeks of gestation period and by the outset of the third trimester, the foetus is able to respond to auditory stimulus. Fernández and Cairn (2011) corroborate this assertion with a reference to a study carried out by Barbara Kisilevsky and her colleagues in 2003. It was discovered that a foetus prefers its mother's voice over that of a stranger and it shows this through an increase in the rate of heartbeat and body movements. This occurs at full-term at about thirty-eight weeks of gestation.

2 First few months

After an approximate six to eight weeks, infants begin to distinguish human sounds, especially the mother's, from others. They show recognition with a smile and engage their expressive skill which begins with response to stimuli like hunger, pain, pleasure, satisfaction, discomfort and so forth, but more importantly however, this is when they begin to produce sounds at will through babbling, crying, and cooing. Babbling is the production of linguistic sounds but which lack any linguistic meaning (Stork and Widdowson, 1974).

Duncan (2013) describes their sounds at this stage as reflexive because it is a reflection of their internal state. During this time too, they recognise human faces and distinguish voiced from voiceless consonants – a distinction called categorical perception (Crain and Lillo-Martin, 1999). In addition, researchers attribute babies' recognition of faces to their innate abilities. However, the question of whether babies' innate abilities is the sole explanation for their recognition of human faces needs to be asked because logically, experience has a contributing factor to this feat too. A child is able to recognise this face because it sees it every day over the weeks; therefore, it becomes familiar with the face and recognition sets in after a while. Potentially, the same can be said of a child and a puppy. Over the months of seeing a puppy, a child becomes so used to that puppy to the point of recognition and being at ease around that particular puppy. Therefore, it seems unmerited and incorrect to attribute all the credit to innateness hypothesis only.

3 Approximately six to ten months

In the sixth month, infants make a wide range of sounds during playtime (Stork and Widdowson, 1974). There is a repetition of open monosyllables, and sometimes, the common phonemes are replaced with other less common ones. Duncan (2013) calls this reduplicative babbling while Stork and Widdowson (1974) call it the reduplication stage.

Even deaf children also display this feature at this stage, although they do not get any primary linguistic data from the environment (Crain and Lillo-Martin 1999). Therefore, this shows that this activity begins as "an internally driven behaviour, not a response to external stimulation" (p. 26). The universality of the process of language acquisition is further emphasised here because children in different communities undergo the same activities and produce roughly the same sounds until about ten months when the environmental factors begin to affect their sounds so that they become peculiar to the immediate environment. This activity is what Duncan (2013) describes as non-reduplicative babbling. They also babble using the stress and intonation contours in their immediate environment. At this stage, deaf children stop babbling. By the ninth month, the infant responds to simple words, gestures and movements.

Regarding the non-linguistic development, the child laughs and wriggles on the floor till they begin to crawl and sit up (Crain and Lillo-Martin, 1999). According to Duncan (2013) however, laughing and vocal play begin at about the fourth month, but this cannot be really countered because, as Brown (1973) states, these developments vary by months from child to child.

4 Approximately one year

By the twelfth month, children respond to commands. They engage their expressive skill when they actively participate in language and speech (Stork and Widdowson, 1974). They begin to produce their first words at about this time; these words are usually in reference to entities in their immediate environment, for example, mummy, mama, daddy, dada, baba, biscuit, poopoo and so forth (Crain and Lillo-Martin 1999; Duncan 2013). A major percentage of the first fifty words of a child's vocabulary will be nouns and will include names of people, objects, animals, foods, body parts and so on (Duncan, 2013). Alongside this is the development of jargons – incomprehensible words which babies say. During this stage, the holophrastic language is engaged – this refers to single-word utterances (Stork and Widdowson, 1974).

Gestures are also introduced, for example, stretching out for a cup of water when thirsty; these gestures may also be accompanied with words. The physical development includes cruising, standing, waving and so on (Crain and Lillo-Martin, 1999). Children acquire an average of nine words per day. Evidently, they are able to do this without specific tutoring. They absorb these words from the conversations and utterances around them; while at it, they also gather some level of word meanings, formation and grammar.

5 Approximately one and a half years

At around eighteen months, a child already has a vocabulary of about twenty words and jargons. Also, Saffran, Senghas and Trueswell (2001) aver that at around this age, there is usually a spurt of new words and word combinations by a child and they understand about one hundred and fifty words. The intonation pattern used for these words is a single pattern – falling tunes on each word and with spaces in-between them. They seem to isolate lexical items from a string of sentences in the primary linguistic data and their vocabulary grows.

Soon, the two-word sentences are put in an intonational group with a fall tune at the end. The physical development includes walking, self-feeding, scribbling lines and colouring.

6 Approximately two years (Stage I)

By the twenty-fourth month, a child is able to combine words into sentences, and go from producing simple sentences to complex ones (Stork and Widdowson, 1974). Brown (1973) proposes that development should be grouped into stages as from the age of two, so that a child who is approximately two years is said to be in Stage I. He notes that the length of a child's utterance correlates very much with the stages of development. An average of the length of the child's spontaneous utterances is used to determine the Mean Length of Utterances (MLU). This is not tantamount to the child's grammatical competence; rather, it gives a clue about the child's language development relative to other children. Children's word order is usually patterned after that of adults and at this stage, there are more content words than grammatical ones. Physical development includes activities like running, pulling off socks, scribbling in circles and so forth (Crain and Lillo-Martin, 1999).

7 Approximately two and a half to three years (Stage II)

Mean length of utterances (MLU) is two point two-five (2.25) words with an approximately nine-hundred-word (900) vocabulary. The child uses more function words and also includes progressive and past tense forms of verbs in their utterances. Other features at this stage include overregularisaton, reference to absent entities and past events, inquisition about the environment and so forth. At this stage, the child is yet to fully master grammatical morphemes, this will happen over the course of several stages. Physical development includes jumping, removing clothes, drawing closed figures and so forth (Crain and Lillo-Martin, 1999).

8 Approximately three to three and a half years (Stage III)

The child's MLU increases to two point seven-five (2.75) words and their vocabulary increases to one thousand and two hundred (1,200). More function words are amassed at this stage and the child uses syntactic transformations which enable it to form questions

from declarative statements, although, mistakes are still inevitable. Brightstone (2000) also submits that by this time, children are able to use language quite elaborately. The physical development at this time includes riding a tricycle, washing their faces, hopping on one foot and so on (Crain and Lillo-Martin, 1999).

9 Approximately three and a half to four years (Stage IV)

MLU and vocabulary increase to three point five (3.5) words and one thousand and five hundred (1,500) words respectively. They produce multi-clause sentences like relative clauses, complement clauses, conjoined clauses, however, overregularisation still occurs. The physical development cues include catching a ball with hands, using a pair of scissors, doing the jigsaw puzzle, telling stories and so forth (Crain and Lillo-Martin, 1999).

10 Approximately four to five years (Stage 5)

At this stage, the average length of the child's words, that is the MLU, increases to four point zero (4.0) while the vocabulary accommodates up to one thousand and nine hundred (1,900) words. The child learns and uses more grammatical words like conjunctions, subordinate clauses, temporal words like "before", "after", "when" are also used. The child now engages its peers in conversations and displays metalinguistic abilities like self-correction and defining words. This shows a conscious awareness of the properties of language on the part of the child. Their display of metalinguistic skills marks a milestone in their development unlike before the present stage when they could not pinpoint or tell what was wrong with their constructions. The child's non-linguistic and physical developmental cues include activities like learning basic mathematical notions (Crain and Lillo-Martin, 1999).

11 After five years

From the age of five years, children's sentences become more complex; between five and ten years, vocabulary increases more slowly. Also, they learn exceptions and stop overregularising (Crain and Lillo-Martin, 1999).

An examination of Stork and Widdowson's (1974), Crain and Lillo-Martin's (1999) and Duncan's (2013) exposition of the stages of a child's language development shows that there are many grounds of convergences. Hence, it can be easily concluded that the universality of language acquisition indeed cuts across different climes, cultures and languages. However, the heavy reliance on the principle of innateness to explain the specific processes of how children acquire language leaves a lot of knowledge outside the purview of linguistics, thus, proving more difficult to use linguistic theories to explain the intricacies of language acquisition.

On the one hand, the studies mentioned above counter Lust's (2006) submission that by their third year, children would have acquired their first language. Hendriks and Spenader's (2006) study on the other hand, corroborates the developmental classifications above when she states that language acquisition begins with the pre-language phase which is between zero and twelve months, and that within this period, there are different phases of acquisition like the egocentric babble phase (4-6 months) and the social babble phase (7-12 months). After the pre-language phase is the early language phase which covers the twelfth to the thirtieth month. She further states that the sound production stages move from crying, to cooing (first month), to babbling (sixth month), to production of first words (tenth – twelfth month), overextension and overrestriction. However, as elaborate as her discussion of the stages is, it does not cover the period when children begin to incorporate the syntax of their languages.

The abilities that put language development in motion are naturally endowed to a child and are shaped by the environment but the degree to which the environment participates in this process is the bone of contention among scholars and their research (Hyams and Orfitelli, 2015). Saffran, Senghas and Trueswell (2001) create a metaphor to explain how children comprehend and engage linguistic resources to create their own language. Children have to carve out words out of the acoustic flow of utterances that adults release, words that are only seldom surrounded by pauses. They have to do this before these words can be assigned to any object in the physical world. Despite the tangible difficulty in this process, these scholars report that from the age of seven months, children are able to do it. While answering the question of how children separate utterances into words, Saffran, Senghas

and Trueswell's (2001) experiment shows that the children were able to do this when they were presented with "miniature artificial languages that embody specific aspects of natural language structure". They submit that

> once an infant has been familiarized with a sample of this language, a new sample, or a sample from a different language, is presented to the infant. Subtle measures of surprise (e.g., duration of looking toward the new sounds) are then used to assess whether the infant perceives the new sample as more of the same, or something different. In this fashion, we can ask what the infant extracted from the artificial language, which can lead to insights regarding the learning mechanisms underlying the earliest stages of language acquisition. (1)

Thus, infants detect when a new language has been introduced and this is manifested with a moment of surprise. According to them, infants are able to recognise words by identifying the syllables. Further studies from these researchers show that they used the eye movements of children to detect children's comprehension of a given instruction. However, as elevated as this study is, it does not seem totally reliable as some of the analyses and findings are vague. Also, it is not clear how the claims in the results have been verified, for instance, the number of children who were used in the study is absent. In addition, it is uncertain whether this number is representative enough for making generalisations.

Brightstone (2000) avers that by the time children are three years old, they can use language quite elaborately, adding that the process may seem simple and ordinary, but an in-depth examination shows otherwise. A typical child's ability to comprehend and use language is limited mainly to their mental and linguistic development. Locke (2009) corroborates this by saying that an effective language acquisition is not the function of the language or the speakers around a child, rather, it is a function of the child and the influence of their genes. Rice (1989:13) emphasises this by saying that in "normally developing children, language emerges spontaneously as a means of talking about what they know so that they can accomplish social goals important to them." One of the remarkable facts expressed by Brightstone (2000) is also conveyed by Rice (1989) and this is that in their second year of

life, children begin to talk quite coherently, and they become adept at using language to express themselves and little or no apparent teaching is needed to achieve this.

2.1.8 Phonological processes

Phonological processes are the changes that occur in sounds when they follow one another in close succession in an utterance. Sounds in isolation are stressed, however, when they occur together in words and with other sounds, the sounds flow into one another, bringing about phonetic and phonemic adjustments like deletion, coalescence, reduction, insertion, assimilation, aspiration, nasalisations, labialisation and so forth (Pike, 1948; Cruttenden, 2001). These changes are what are referred to as phonological processes or connected speech processes. Although these two terms refer to the same phenomenon, it was discovered during the course of this research that phonological processes are often used to refer to the changes that occur in children's utterances as found in studies like Bowen (2011) and Ball (2016), while connected speech processes are used in reference to adult utterances as found in research like Nolan and Kerswill (1990), Roach and Widdowson (2001), Oladipupo (2014) and so on. Therefore, the term phonological processes has been adopted to refer to the changes that occur when sounds co-occur in children's utterances.

Phonological processes constitute a major part of language development in children; this is because children, as a result of their ongoing development, do not have complete control of some of their articulators such as the lips, tongue, teeth, and jaw, hence, they end up simplifying certain words and phonemes for ease. These simplifications occur in different ways and Akpan (2004) sectionalises them into three groups which are substitution, assimilatory and syllable structure processes, while Roach and Widdowson (2001) group them into assimilation, coarticulation and elision. However, the shortcoming with these two groupings is that there are certain phonological processes that do not fit into any of these groups, while there are some others which fit into more than one group. Thus, this breeds a problem of classification.

These processes occur among both typically and atypically developing children as well as adults, although their instantiations are often different. Ball (2016: p. 14) describes phonological processes as a

> mental operation that applies in speech to substitute for a class of sounds or sound sequences presenting a common difficulty to the speech capacity of the individual, an alternative class identical but lacking the difficult property.

Levelt (2013) describes the situation as when difficult sounds are simplified or replaced by less difficult ones. Sounds in citation forms or in isolation are often different in pronunciation compared to when they occur in the company of other sounds. Giegerich (1992: p. 249) notes that "citation forms are a form of speech that is, to say the least, somewhat idealised".

Wundt (1900) provides the result of what happens when sounds occur together and influence one another. He describes the major ones as assimilation and dissimilation; the former refers to how sounds become more similar as against when they occur alone. The latter is the opposite, sounds become less similar than they would be when they occur in isolation.

Also, about English phonological processes, Sutomo (2012) states specifically that they occur both at the word and the phrasal levels and that these processes are caused by the influence of syntactic factors. At the word level, morphemes are combined with other morphemes, bringing about some form of change on at least one of the morphemes. Concerning these processes, Kerswill (1985) avers that consonant and vowel sounds are transformed or even deleted sometimes; sounds which occur beside others are modified to sound like the ones in their environment. These are all processes that occur when there is a progressive sequence of words in speech (Nolan and Kerswill, 1990). Oladipupo (2014) adds that phonological processes are a manifestation of intrinsic human tendencies to react to the challenges of speech by simplifying difficult sounds. Some of these processes are discussed in the subsequent paragraphs.

1. **Vowel strengthening:** This process affects English central vowels which are usually weakly produced. Vowel strengthening occurs when this otherwise weak vowel segments are produced with more amplitude and acoustic energy to strengthen them. Thus, central vowels are produced like front or back vowels (Bowen, 2011).

2. **Substitution:** Substitution refers to total replacement of one sound with another one. There are several varying motivations for the occurrence of this process. In clear terms however, it involves a replacement of one sound with a totally different one (Ball, 2016).
3. **Deletion:** Deletion is also known as elision and it can affect both vowel (apocope) and consonant phonemes (syncope) in different parts of a syllable. Thus, there are different types like final consonant deletion, initial consonant deletion. Deletion can also affect whole syllables, especially weak ones. Often, the syllable containing schwa is elided in the child's speech (Bowen, 2011).
4. **Monophthongisation:** This process refers to the reduction of a diphthong or a triphthong to a pure vowel. This means that one or two constituent vowel phonemes in a diphthong or a triphthong, respectively, is removed in order to achieve this process. In the case of a diphthong, the two vowel segments may also merge into one to produce this pure vowel. The end product of this process is that only one vowel phoneme emerges (Bowen, 2011).
5. **Assimilation:** Assimilation is the modification of a sound in order to make it similar to some other sound in its environment. This modification can occur in the area of voice, place of articulation or manner of articulation. A major class of words in the English language that are affected by assimilation are the allomorphs for regular plurality morpheme and regular past tense markers (Laver, 1968).

   There is also a directionality involved in assimilation process, that is, it can be forward or backward in direction (Zsiga, 2011). When assimilation occurs in segment 2 because of segment 1, then assimilation is progressive, however, when assimilation occurs in segment 1 because of segment 2, then it is said to be regressive. Assimilation can also be bidirectional but this is very rare in the English language and its varieties. There are different types of assimilation and these get their differentiation and nomenclatures from the type of sounds that are involved in the assimilation. Some of them are palatalisation, labialisation, and nasalisation (Chapitré, 2005). Labialisation, patalisation and nasalisation are when non-labial, non-palatal and non-nasal sounds, respectively, are produced as such because of their proximity to these sounds.

Zsiga (2003: p. 1934-5) says about assimilation processes specifically, that they are innate because "the phonetic motivation for such processes is clear, and the motivation works in the direction of making speaking easier". She goes on to expound the reasons assimilation occurs – this is because articulatory organs cannot move quickly enough to prevent from 'running' into one another, therefore, the activity of one cannot be ended quickly enough for another to begin, hence, these organs form a continuum of activities, which results into a continuum of sounds.

Apart from voice, laryngeal features of obstruents and sonorants also sometimes interact. Zsiga (2011) states that local assimilation is the commonest type of phonological process, and this means that it is central to the workings of phonological theories and phonological features. Assimilation also occurs with vowels when they occur in the context of nasal sounds; this is called nasalisation. While in the case of continuants, stops usually transform into continuants when preceded by continuants. A stop can also change to a fricative; this is known as spirantisation and can be perceived as a form of assimilation of the feature. Zsiga opines that the assimilation of place of articulation is easily the most common phonological process, especially the nasal place of assimilation.

6. **Dissimilation:** This process involves the enhancement of the distinctions between sounds so that sounds become more auditorily different from the others in the environment. This process enhances perception and is found in a limited set of words in the English language. A good instance is when the morpheme -al is added to some nouns. This closed set of words is a residue from Latin (Chapitré, 2005).
7. **Gliding:** This usually involves sliding from the production of one segment into another one. An articulator moves from one point of articulation to another, hence producing a similar but still different sound. This process occurs when /u/ becomes /w/ and /i/ becomes /j/ (Bowen, 2011).
8. **Yod Coalescence:** Coalescence is when two sounds merge into one. This newly produced sound then shares phonological and/or phonetic qualities with the two original sounds responsible for its emergence. Weisser (2005) notes that yod coalescence has to do with the blend of an alveolar plosive segment or a fricative

with a back vowel. Weisser (2005) makes a distinction between yod coalescence and u-coalescence, however, this separation appears unnecessary because both sub-classes involve the same sets of sounds for coalescence to occur.

9. **Voicing:** Voicing is said to have occurred when an otherwise voiceless consonant phoneme is produced with the vibration of the glottis because of its proximity to another voiced segment. Since vowel segments are always voiced, this process only affects voiceless consonant segments (Bowen, 2011).
10. **Devoicing:** When a segment that is ordinarily voiced loses its voice feature because of its proximity to a voiceless segment, the process that has occurred there is devoicing (Bowen, 2011).
11. **Stopping:** When air from the lungs is not released gradually as found in a fricative but released suddenly and explosively like a plosive, then stopping has occurred (Bowen, 2011).
12. **Reduplication:** This refers to the repetition of part of a syllable or the whole syllable (Ball, 2016).
13. **Cluster reduction:** Cluster reduction occurs when the consonants that make up a cluster are reduced, thus simplifying the cluster (Ball, 2016).
14. **Epenthesis:** When a sound is inserted in-between two consonants, it is called epenthesis. It is often used to break up consonant clusters although this is not the only context in which it occurs (Bowen, 2011).

2.2 Empirical literature on child language studies

Empirical research on child language acquisition is reviewed in this section to shed more light on what has been done so far on the subject matter. Prescriptive and descriptive studies on child language acquisition have been reviewed in subsequent subsections. Also, the third subsection is dedicated to research on phonological processes. Finally, the fourth subsection contains an appraisal of all the reviews.

2.2.1 Prescriptive studies on child language

Alerechi (2011) studied consonant substitution in the language of an Ikwere child. The study submits that children's simplification of the language being acquired can contribute

to so much language divergence that adults will then need to learn children's language. However, this assertion is not entirely valid because it is gathered from empirical and conceptual review that the language of children undergoes phases; it is constantly subject to change as their anatomy, especially their speech organs, develop. The peculiar simplification of sounds that they engage in is only for a while, because they assimilate towards adult speech as they grow older. For these reasons, this study's conclusion that children's language use can lead to divergence cannot be accepted. Hence, there is never a need to learn children's language because children eventually attain adult target language, except in the case of atypically developing children.

Five to eight-year-old bilingual children of Igbo and Yoruba languages were the focus of Onwubiko's (2011) language development studies. The study concludes that the Igbo-Yoruba bilingual children have articulation problems which manifest phonologically as omission, substitution, consonant deletion, and epenthesis in their use of the English language. The instances presented of these processes show that they are found even among adult speakers too. Hence, it is erroneous to label them as articulation problems because children will always eventually acquire their ambient language in a matter of months.

Hutauruku (2015) studied the language acquisition process of children between one and three years of age. It adopts an eclectic theoretical approach, drawing on insights from proponents of different theories some of whom are Chomsky, Lyons, Bolinger, Fromkin, and Steinberg. This theoretical combination made the analysis to lack a clear focus because of the proponents' divergent views on children's language acquisition. Furthermore, the study termed the participants' phonological processes as problems and errors caused by laziness. On the contrary however, it is incorrect to label these features as problems or errors because these are actually features of progress in the process of language acquisition (Rice, 1989; Crain and Lillo-Martin, 1999; Lust 2006; Fernández and Cairns, 2011). A closer examination of the instances cited in the work showed that the children were following the existing pattern in that language, although these patterns were sometimes over-obeyed. Hutauruku (2015) focused on the children's language use from the perspective of errors and problems, and not from that of development.

Etim, Dada, and Bassey (2018) tested fifteen children for their use of five phonological processes. Their utterances were recorded and fed into the PRAAT Language software for analysis. Simple percentage and generative phonology were also used for analysis which shows that the children exhibited the five tested phonological processes. However, the study also concluded that the children were deficit in the pronunciation of affricates, velar frontings, liquid gliding, final consonants and consonant clusters, and that the processes were impairments. The research further suggested that remedying intervention strategies and therapy sessions be instigated for the children. The study's conclusion and recommendation prove that many linguists and researchers perceive phonological processes in children's language use as errors that one should be wary of. However, they are actually ways through which a child's language domain and, by extension, their general development can be described.

The phonological features of ten Lagos-resident Nigerian children of educated parents were examined in Ademola-Adeoye (2019). The identified phonological processes were substitution, voicing, cluster reduction, deletion and reduplication. The study concluded that the children were more disposed to acquire the Nigerian variety of English than the Received Pronunciation (RP). However, this conclusion is rather unexpected; children acquire their ambient language and so are unlikely to acquire the RP when it is not spoken around them. Thus, comparing the children's phonological processes to Received Pronunciation shows that the study is prescriptive. Its failure to consider the contemporary fluidity of the RP (Jowitt, 2016) already faulted the study's objective. Apart from this, it was erroneous to expect the children to articulate the RP even when they had never been exposed to it. This is because children acquire the variety of language that is spoken around them.

The following sub-section contains descriptive studies on phonological processes and children's language acquisition. These studies cover both monolingual and bilingual children.

2.2.2 Descriptive studies on child language

Akpan (2006) studied the assimilation process of an Ibibio monolingual child and the following assimilations were discovered – homorganic nasal assimilation for both vowel and consonant phonemes, nasalisation of vowel and consonant sounds, voicing, labialisation and substitution. The classification of substitution as an assimilation process raises questions. Also, the study only showed the frequency of the instances, the peculiarity of the phonological processes was not adequately discussed in relation to the Ibibio monolingual, even when more generalisations and deductions could have been drawn from the data. Akpan (2006) concluded that assimilatory processes should not exist beyond five years, but if it does, such child should be made to undergo therapy because it is a sign of disorder/impairment. However, this is not entirely the case because phonological processes are not features of child language only, they are also found in the language of adults, although they manifest differently. Hence, it is important to always add this clause so as not to get parents, guardians and teachers unnecessarily worried or mislead researchers and language enthusiasts.

Also, Ambrose (2010) investigated one Gwong child's use of semantic overextensions and phonological processes. Gwong is one of the languages used in Kaduna State, Nigeria. The phonological processes studied are assimilation, reduplication, substitution, consonant cluster and syllable simplification. Some of this study's findings are that the participant used more nouns, followed by verbs. This corroborates what has been established in the literature that children acquire more nouns before other word classes because these are usually the names of the people around them, the food they like to eat, their favourite pets and toys and so forth. Hence, it is easier for them to acquire and use these words before other word classes. This is buttressed by some of the child's first words: "Hyedah (her elder sister), uncle (in reference to the researcher), ball, car, drink, see, take, finish, it, me, yes" and "hey". All these confirm that language acquisition principles are universal among typically developing children. The study is however extremely limited by its sample size, thus, many of its findings are not generalisable.

Menn and Vihman's (2011) study on the features of child phonology leans towards an emergentist model of feature acquisition. Data for the study was collected from about fifty children who spoke Estonian, Finnish, Japanese, Welsh and some Germanic and Romance

languages. The study deliberately countered the innateness hypothesis. In answer to its question as to whether children's phonological features are innate, the study proposed that the combination of the language that children hear, their cognition which is still developing, and their articulatory organs which will also keep developing for a while, is responsible for their language production. It refutes the claim of nativism that an innate feature is solely responsible for language acquisition. Therefore, the study concludes that language acquisition features are inherent only in the sense that they are biological processes, not arbitrary ones. They are also products of an interaction between the different components of the system described above. The study clearly states that the acquisition of these features is not "pre-experiential cognitive given" (p. 284).

Eren (2015) examined the acquisition of the alveolar tap (/ɾ/) in sixty three-to-five-year-old children in Gazientrop province, Turkey. At age five, the children were yet to attain 75% of /ɾ/ occurrences in words; also, four-year-olds did not produce up to 50% of the total of the /ɾ/ occurrences in words. The study's objective was an attempt to get normative data towards a standardisation of Turkish articulation. However, the realisation of this objective may be very minimal because many of children's phonological features are temporary. They have not yet completely mastered how to manoeuvre their speech articulators, but when they eventually do, their utterances will change too and become more similar to an adult variety. Therefore, it becomes a futile effort to describe their language for the purpose of standardisation because this phase is not a permanent one. Furthermore, the study is silent about whether the data collection from the three different parts of the province has any effect on the children's production of the alveolar tap /ɾ/. At 5:0-5:11 years, the children were yet to fully acquire /ɾ/, showing that the children's language was still developing at age 5. Having established in its literature that the acquisition of /ɾ/ is usually completed by age 6 among Australian, English, Spanish, Arabic and American-speaking children, the researcher ought to have included six-year-olds in the sample size. Thus, the study's submission that the children were experiencing some kind of delay is incorrect.

Phonological processes in a non-standard variety of Portuguese as produced by two- to six-year-old children were the focus of Quelroga, Rosal, Solva and Cordeiro (2015). The utterances of two hundred and two kindergarten children who were enrolled in public

schools in Recife were recorded, transcribed, coded and tabulated for easier descriptive analysis. The results of the analysis showed that the most common phonological processes were consonant cluster simplification, syllable reduction and simplification of final consonants. Liquid consonant simplification, frontalisation of palatal and posteriorisation of palatal processes ceased before the age the researchers projected. However, the participants continued to simplify consonant clusters and the researchers related this to the effect of socio-cultural issues in the society. The study suggested that sociolinguistics should be considered when examining children's phonology to prevent misjudgement. Notably, the study recorded progress in the children's phonology, but it is silent about how long it gathered data from the participants; this could have been instrumental in replicating a similar research elsewhere.

Yousofi and Ashtarian's (2015) study identified three stages of language use from birth; these are the protolanguage, prespeech and true word stage (adult language). The study explored the percentage of proto and true words in the Kurdish of a child between 9 months and 36 months of age. They discovered that a major percentage of the child's proto words were produced in the first six months of the child's second year; however, the articulation of these words continued into the twenty-ninth month during which the child also used true words very frequently. The study infers that factors that influence a child's lexicon use are both general and language-specific; also, these factors are strongly related to the people around the child as well as its immediate needs. As a child advances, more variation is observed in its language use. Although the study is a longitudinal one, the distinction of child language into three parts (protolanguage, prespeech and true word) is not really shown in the data provided, rather, only two aspects were focused on which are the protoword and the true word.

Ibrahim and Ibrahim (2016) investigated morphological and phonological processes in the language acquisition process of six Hausa children. The different types of reduplication found in the data include reduplication of a CV syllable, harmonising consonants, word reduplication and imitation of onomatopoeic sounds. However, the study was neither explicit about its methodology nor in-depth in its discussion. The study was silent about the

ages of the children, thus, it is impossible to tell whether the production of only a CV syllable structure is age-appropriate or not.

Adeniyi and Adeniyi's (2017) study described the consonant sequence reduction of four children who were simultaneously acquiring English and Yoruba. Of these four children, two were acquiring English primarily and Yoruba secondarily (group 1) while the other two had Yoruba as their primarily acquired language (group 2). It was discovered that group 1 deleted the most sonorous consonant in the sequences, while group 2 reduced consonant sequences through coalescence. These findings are precise and point to the need to carry out a larger investigation on children's phonology because, the limited sample size means that the findings are not generalisable and could have been influenced by the participants' idiosyncrasies.

Olarewaju (2018) explored English syllable acquisition in ten bilingual children of English and Yoruba languages between the ages of 1;7 and 5;0. A fairly regular pattern of syllable structure acquisition was discovered among the children despite variations in their acquisition rate, physiological maturation and exposure to new words. Although the study states that the interference of Yoruba in the children's acquisition is minimal, it is not explicit about this. This is especially important because of the different phonotactic structures of both languages. The subjects also simplified new and complex words into their marked structures through deletion, epenthesis and substitution. Although these processes are not the focus of the study, they introduce a new dimension to how children's acquisition processes can be investigated especially because these processes are instinctive.

The effect of sonority on consonant cluster production among bilingual children of Yoruba and English was the focus of Olarewaju and Sunday (2020). The participants were found to prefer less sonorous obstruents to the highly sonorant consonants whenever a consonant cluster occurred. To achieve this preference, the children deleted some segments, and these deletions occurred more at the onset where single consonants were more preferred. However, the study's sample instrument dwelt more on onsets than on codas because there were five and two words testing onsets and codas, respectively. Thus, the conclusion that the participants deleted more consonants from onsets could be as a result of this imbalance in instrument.

Sunday and Olarewaju's (2020) investigation of the acquisition of complex coda among bilingual children of English and Yoruba showed a kind of progression in the articulation of children from 1 to 5 years, so that children who were three years and below still showed a great variation from that of adults, while those who were between four and five years had immensely assimilated towards the ambient language. However, the study's treatment of the productions of these two quite different groups using the same scale seems erroneous and problematic because both groups actually exhibit different phases of language acquisition. Specifically, children who were three years and less reduced their consonant clusters greatly, while children who were four and five years did not.

2.2.3 Phonological processes

Zsiga (2011) focused on local assimilation as found in different languages around the world; the study gives an exposition on the intricacies of local assimilation, clearly distinguishing it from long-distance assimilation. The study culled relevant instances from different languages like English, Russian, Yoruba, Turkish, Japanese, Ancient Greek, Zulu, and a myriad of other languages. The instantiation from languages as many as this only proves further that phonological processes are features of language that can be found in all the languages of the world.

Epenthesis is another very common phonological process and Hall (2011) describes it as the insertion of a vowel in an utterance to adjust a word whose structure does not match the structural provision in a language. This researcher notes that there is no known reason for the phonotactic structures that engender epenthesis but adds that sometimes, a particular ordering of consonant phonemes prompt the intervention of an epenthesis no matter what the syllable requirements of that language is. She cites Côté (2000) who argues that epenthesis occurs because of the need to make some consonants much more audible than they are. However, audibility is not the only motivation for epenthesis; sometimes, the phonotactic provision of a language does not permit consonant clusters, thus, a speaker resorts to epenthesis in order to obey this phonotactic rule. A good instance of this is the case of consonant cluster prohibition in Yoruba, and its permission in English.

Sutomo (2012:11) employs the generative phonology theory to explain the phonological process of assimilation and other morpho-phonemic changes in English language. The study concluded that "one rule can apply in many other niches of the same phonological context", hence, "language is [a] really rule-governed behaviour". These applications help to understand the phonological changes that happen when sounds co-occur, however, Oladipupo (2014) opposes this idea when he argues that "phonological processes are phonetically motivated and not rule-governed as generative phonology proposes" (p. 2). He also states that "these processes are results of innate human tendencies to respond to the difficulties of speech by simplifying difficult sounds". With these, Sutomo's application of generative phonology to phonological processes seems inadequate.

Oladipupo (2014) studied aspects of sound modifications and simplifications in speech in order to discover features of connected speech in Standard Nigerian English. To this end, he applied natural phonology as theoretical framework and engaged three hundred and sixty educated Nigerian English speakers as sample population. He identified three groups of connected speech processes and labelled them dominant, minor and idiosyncratic processes, where only the dominant processes were recognised as typical of Nigerian English speakers and were therefore referred to as the standard. Oladipupo faults the earlier works of phonological perspective on Nigerian English as only carrying out an identification of these phonological processes without any attempt at determining their extent of use. Therefore, he set out to identify, quantity and categorise these processes in Nigerian English in order to decipher a standard. However, the study was silent about the specific language groups that were sampled as well as their distribution.

Josiah and Soneye (2014) set out to identify some phonological processes in the spoken language of some one hundred university students from five federal government-owned universities in the country. The aim of this research was to add to existing literature, research and data on the educated variety of the Nigerian English. Their inference that educated Nigerian English (NE) is largely endonormative and indicative of an emerging Nigerian English variety only further confirms what has already been established in the literature on the subject matter. This study is inherently prescriptive, rather than descriptive, in its comparison of NE to standard British English. The method of analysis is also

questionable only words were identified, not specific sounds or processes as expected. The study concludes that assimilation is "a normal occurrence in Nigerian English and in most second language situations" because of some factors as mother tongue interference, slower tempo of utterance, idiosyncratic patterns of realisation, influence from socio-cultural and educational standards, social status, speech style, among others. The case however, is that assimilation is a normal feature in connected speech even in a native speaker's language use and such use does not have to be as a result of any of the reasons that the study has listed.

Utulu (2014) focused on the monophthongisation and vowel lengthening processes in educated Urhobo English using the paradigms of moraic theory as anchor for the analysis of the study. The study set out to find out the motivation for the speakers' lengthening of the first vowels of standard British English closing diphthongs (/eɪ/ and /əʊ/). The analyses revealed that the reasons for this lengthening are to preserve the weight of the deleted closing vowels and to reflect the components of the falling fundamental frequency contour of English final open syllables. The discovery of this deletion within the monophthongisation process substantiates Oladipupo's (2014) suggestion that phonological processes are attempts at simplifying sounds that prove to be difficult in pronunciation for speakers. Utulu (2014) goes further to generalise that the two motivations underline the simplification process of the same set of closing diphthongs in many non-native English accents of Africa and Asia. However, the study which was carried out on a minority tribe in Nigeria does not have enough premise to make such generalisation about non-native English accents in Asia and the entirety of Africa.

2.2.4 Appraisal of literature review

These reviews show the extent and depth of research carried out within the purview of child language studies and phonological processes, outside and especially within Nigeria. They create the needed contextual background within which to situate the current study. Some of these studies (Alerechi, 2011; Hutauruku, 2015; Onwubiko, 2011; Ademola-Adeoye, 2019; Etim, Dada and Bassey (2018) are prescriptive because they perceive children's phonological processes as problematic, erroneous and adulterated, and stipulate that these processes should be either like that of adults or like Received Pronunciation.

However, studies like Akpan (2006), Ambrose (2010), Onwubiko (2011), Adeniyi and Adeniyi (2016), Ibrahim and Ibrahim (2016), Olarewaju (2018), Olarewaju and Sunday (2020) and Sunday and Olarewaju (2020) explored the phonology and phonological processes of Nigerian children, hence contributing to child language studies in Nigeria. These studies described what occurred in the language of the participants, thus contributing to the literature of what a Nigerian child's phonology is like. Eren (2015), Quelroga, Rosal, Solva and Cordeiro (2015), and Yousofi and Ashtarian (2015) have also provided literature for the expansion of child language studies.

These studies are far from exhaustive of what can be done regarding Nigerian children's English phonological processes. In fact, some of these studies investigated children's indigenous language use (Ambrose, 2010; Ibrahim and Ibrahim, 2016) while some others studied bilingual children (Adeniyi and Adeniyi, 2016, Olarewaji, 2018; Olarewaju and Sunday, 2020; Sunday and Olarewaju, 2020). Also, some were longitudinal (Quelroga, Rosal, Solva and Cordeiro, 2015; Salim and Mehawesh, 2014) while others were cross-sectional. These studies, despite their wealth of contribution to child language studies, are lacking in a deliberate effort of using these language nuances to establish or describe the development of a child, particularly a typical Nigerian child. Also, whereas, both methods are beneficial to any language study, these studies used either to sample their participants. Therefore, as a means of tracing children's development, this study set out to explore phonological processes of Nigerian children's spoken English, using cross-sectional and longitudinal data collection methods.

2.3 International Phonetic Alphabet

The International Phonetic Alphabet was developed sometime in the nineteenth century to provide a uniform pronunciation system for the languages of the world. This is done by the assignment of a symbol to each phoneme of languages. This Alphabet proffers a uniform representation of the spoken forms of the world languages. It has been revised occasionally by the International Phonetic Association (IPA). The alphabet can show both phonemic and phonetic transcriptions (Augustyn, et al. 2015).

The International Phonetic Alphabet is presented below:

THE INTERNATIONAL PHONETIC ALPHABET (revised to 2005)

CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k g	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			r					ʀ		
Tap or Flap		ⱱ		ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

Where symbols appear in pairs, the one to the right represents a voiced consonant. Shaded areas denote articulations judged impossible.

CONSONANTS (NON-PULMONIC)

Clicks		Voiced implosives		Ejectives	
ʘ	Bilabial	ɓ	Bilabial	’	Examples:
|	Dental	ɗ	Dental/alveolar	pʼ	Bilabial
!	(Post)alveolar	ʄ	Palatal	tʼ	Dental/alveolar
ǂ	Palatoalveolar	ɠ	Velar	kʼ	Velar
‖	Alveolar lateral	ʛ	Uvular	sʼ	Alveolar fricative

OTHER SYMBOLS

ʍ	Voiceless labial-velar fricative	ɕ ʑ	Alveolo-palatal fricatives
w	Voiced labial-velar approximant	ɺ	Voiced alveolar lateral flap
ɥ	Voiced labial-palatal approximant	ʧ	Simultaneous ʃ and x
ʜ	Voiceless epiglottal fricative		
ʢ	Voiced epiglottal fricative		
ʡ	Epiglottal plosive		

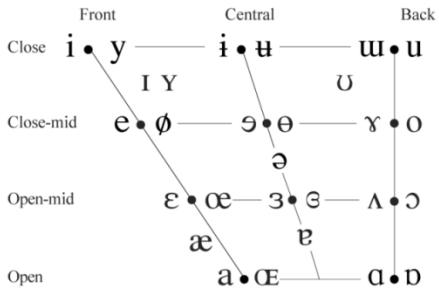
Affricates and double articulations can be represented by two symbols joined by a tie bar if necessary. k͡p t͡s

DIACRITICS

Diacritics may be placed above a symbol with a descender, e.g. n̥ŋ̊

Voiceless	n̥ d̥	Breathy voiced	b̤ a̤	Dental	t̪ d̪
Voiced	s̬ t̬	Creaky voiced	b̰ a̰	Apical	t̺ d̺
Aspirated	tʰ dʰ	Linguolabial	t̼ d̼	Laminal	t̻ d̻
More rounded	ɔ̹	Labialized	tʷ dʷ	Nasalized	ẽ
Less rounded	ɔ̜	Palatalized	tʲ dʲ	Nasal release	dⁿ
Advanced	u̟	Velarized	tˠ dˠ	Lateral release	dˡ
Retracted	e̠	Pharyngealized	tˤ dˤ	No audible release	d̚
Centralized	ë	Velarized or pharyngealized	ɫ		
Mid-centralized	e̽	Raised	ɹ̝ (ɮ̝ voiced alveolar fricative)		
Syllabic	n̩	Lowered	β̞ (ɹ̞ voiced alveolar approximant)		
Non-syllabic	e̯	Advanced Tongue Root	ɹ̘		
Rhoticity	ə˞ a˞	Retracted Tongue Root	ɹ̙		

VOWELS



Where symbols appear in pairs, the one to the right represents a rounded vowel.

SUPRASEGMENTALS

ˈ	Primary stress
ˌ	Secondary stress ˌfoʊnəˈtɪʃən
ː	Long eː
ˑ	Half-long eˑ
̆	Extra-short ĕ
|	Minor (foot) group
‖	Major (intonation) group
.	Syllable break ɹi.æk.ʃən
‿	Linking (absence of a break)

TONES AND WORD ACCENTS

LEVEL		CONTOUR	
é or ˥	Extra high	ě or ˩˥	Rising
ē or ˦	High	ê or ˥˩	Falling
e̋ or ˧	Mid	e᷄ or ˧˥	High rising
è or ˨	Low	e᷅ or ˩˧	Low rising
ȅ or ˩	Extra low	e᷈ or ˥˩˥	Peaking
↓	Downstep	e᷉ or ˧˩˧	Dipping
↑	Upstep		

Fig. 2.3 The International Phonetic Alphabet

Augustyn, A., Bauer, P., Duignan, B., Eldridge, A. Gregersen, E., Luebering, J.E., McKenna, A., Petruzzello, M., Rafferty, J.P., Ray, M., Rogers, K., Tikkanen, A., Wallenfeldt, J., Zeidan A., and Zelazko, A. 2015. *Britannica Encyclopaedia*. Chicago: Encyclopaedia Britannica. 404.

2.4 Theoretical framework: Optimality Theory (OT)

Optimality Theory has been adopted as the theoretical framework to explain the instantiation of processes which the participants have adopted. Therefore, the following paragraphs are dedicated to discussions on, reviews and the use of OT.

Optimality Theory is a linguistic theory proposed by Alan Prince and Paul Smolensky (1993). The theory was originally designed to answer questions in phonology but is now also applied to other linguistic areas like syntax, semantics, sociolinguistics, and historical linguistics (McCarthy, 2007). In essence therefore, OT is a broad theory that covers the different aspects of grammar (Kager, 2001).

Optimality Theory is an offshoot of Generative Grammar, a theory whose emphasis is on the description of the structure of language and universal principles; this description is done using experimental observation of linguistic typology and how language is learned, whether

children's first language or adults' second or third language. Although OT came out from generative grammar, it is fundamentally and essentially dissimilar from it in more ways than one. First, OT is based on the assumption that universal constraints are violable while previous models worked based on the premise of parametric variation of inviolate principles (Kager, 2001).

This theory thrives on constraints rather than rules like other approaches to phonological analysis. Generally, OT deals in the different operations and transformations that take place between the insertion of an input into a grammar and the eventual production of an output. These inputs are evaluated based on the hierarchy of constraints in that language; this is to say that the same set of constraints are available to all languages, however, they are ranked differently in each, hence their difference. These lead to a choice of one structure which violates the least number of highly ranked constraints.

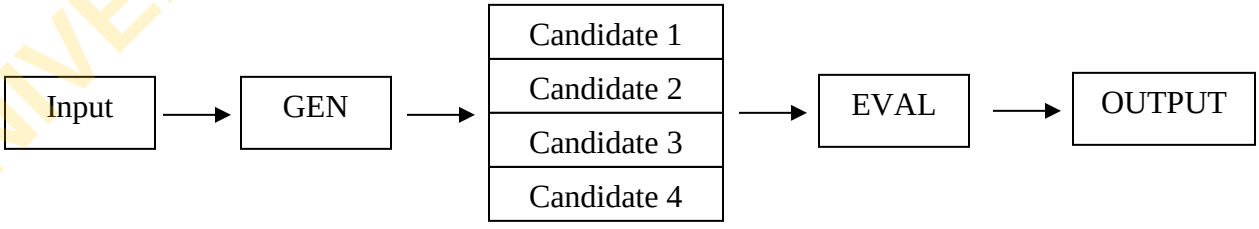


Fig. 2.4 A schematic grammar at work

McCarthy, J. J. 2007. What is optimality theory? *Linguistics Department Faculty Publication Series.* Massachusetts: University of Massachusetts Amherst. p. 3

Certain components are central to the workings of OT and these are GEN, CON and EVAL. GEN generates candidates which are evaluated by EVAL based on the ranking of constraints (CON) in that language (McCarthy, 2007). In other words, EVAL determines which candidate emerges as the optimal candidate. Figure 2.4 illustrates these relationships. GEN generates an infinite list of candidates based on what it receives in the input – this is described as the richness of the base. This set of candidates is subjected to evaluation where candidates who do not meet up with the requirements of the constraints, especially, the highly ranked constraints are screened out. EVAL uses the hierarchy of constraints in a language as the basis for determining which candidate is harmonic (McCarthy, 2007). Thus, all the components of OT are universal except for the different rankings of constraints which distinguish one language from the others.

Linguistic structures can be described as having two features based on markedness, and this is whether they are marked or unmarked. A linguistic structure is said to be marked when it has a different and unique feature which stands it out from the other structures in a language. "Unmarked values are cross-linguistically preferred and basic in all grammars while marked values are cross linguistically avoided and used by grammars only to create contrast" (Kager, 2001: p. 2).

Furthermore, a structure's marked or unmarked state is not usually randomly decided, rather, it is a function of the different but interwoven systems in a language. The major components of OT are discussed further in the subsequent paragraphs.

2.4.1 GEN(erator)

This component, on getting an input, generates an infinite set of all possible realisations; these possible outputs are called candidates. There is a basic and important assumption that there are no language-specific limitations on the generated candidates as long as the elements of composition are licit and within the language – this assumption is referred to as the *richness of the base*. For instance, when dealing with prosodic structure, the expected licit elements include mora, syllable, foot, prosodic word; when dealing with morphology, such licit elements include root, stem, word, affix etc; when dealing with syntax, licit elements include x-bar structure, heads/complements, and specifiers (Kager, 2001).

Different possible structures are permitted to be generated here because they will still be subjected to assessment according to the constraints in the language under consideration. GEN has a feature known as *freedom of analysis* and this affords it the opportunity to generate candidates freely and even repeatedly. Since GEN is considered to be a universal feature, it is important to lend it the freedom it requires to generate all the possible options for the input in a language. The grammar of a language involves how the constraints are ranked, and this ranking in turn determines which candidate will be ruled as the optimal candidate by EVAL (Kager, 2001).

2.4.2 CON(straint)

After GEN has generated the candidates, they are subjected to the constraints as they are ranked in the particular language. Constraints are the criteria that an output must obey for it to be considered a bon-a-fide part of a language. This requirement can either be obeyed or violated by the candidate (Kager, 2001: p. 9). These constraints are found in all languages, that is, they are universal, however, they are ranked differently in all languages, hence, the difference in the languages of the world. CON helps to decide which candidate should be the harmonic candidate. Nonetheless, it is important to note that the violation of a constraint is not equal to ungrammaticality, neither is the satisfaction of a constraint equal to grammaticality. Rather, constraints are inherently competitive and so are always in conflict so that an output will always have to violate some constraints but satisfy some others for it to emerge as an optimal or a harmonic candidate. The conflicts among these constraints are usually resolved by ranking them (McCarthy, 2007).

A more highly ranked constraint is satisfied above another constraint which is not as highly ranked; this proves that the idea of a well-formed structure is relative to different languages. What is well-formed in language A may be ill-formed in language B; it is all a function of which constraint is ranked higher or not in one language or the other. In simple terms, constraint ranking is the reason that languages are different from one another (Kager, 2001).

There are two types of constraints – the faithfulness constraint and the markedness constraint. The **faithfulness constraint** mandates that the optimal candidate must match the input; in other words, the surface structure (output) must tally with the underlying one

(input) in a particular way. In other words, it prevents the harmonic emergence of structures that do not resemble the input. Faithfulness constraint is described as conservative because of its requirement for a look-alike between the input and the output. Examples of faithfulness constraints include the following:

1. The output must preserve all segments present in the input.
2. The output must preserve the linear order of segments in the input.
3. Output segments must have counterparts in the input.
4. Output segments and input segments must share values for [voice].

(Kager, 2001: p. 10)

Markedness constraint on the other hand imposes a particular well-formedness pattern on the output, such that changes are motivated and impressed on the output, making it different from the input. This class of constraints is unconcerned about the input; it deals centrally with the output. These two types of constraints are often in conflict because markedness enforces particular structures on candidates which faithfulness is in conflict with. Examples of markedness constraints include the following:

1. Vowels must not be nasal.
2. Syllables must not have codas.
3. Obstruents must not be voiced in coda position.
4. Sonorants must be voiced.
5. Syllables must have onsets.
6. Obstruents must be voiced after nasals.

(Kager, 2001: p. 9)

For a candidate to be optimal, "*some* constraint that favors the winner over the loser must dominate *every* constraint that favors the loser over the winner. The logic of this statement follows from the properties of EVAL. Constraint ranking arguments depend on this logic" (McCarthy, 2007: p. 7). There are three important elements that validate a ranking argument. First, the ranked constraints have to conflict in their evaluation of competing candidates from an input; second, one of the competing candidates has to be the harmonic candidate and the constraint that favours it must be more highly ranked than that which favours the other candidate(s). Third is that the ranking argument is safe only when there is no third constraint. Constraints are violable, however, violability must be minimal.

Optimality Theory neither compromises nor suppresses constraints, instead, what holds is a **strict domination** of constraints in a hierarchy. In this domination, the more highly ranked constraint is regarded above the other which is not as highly ranked. Therefore, a candidate becomes optimal when it incurs a violation of the least number of highly ranked constraints (McCarthy, 2007).

Furthermore, a lower ranked constraint can be violated in order to prevent a candidate from violating a higher-ranked one; violation is often kept to the minimum in order to meet the requirement of maximal harmony. The core essence of minimal violation of constraints is that every instance of violation of constraint should help prevent the violation of a higher ranked constraint (Prince and Smolensky, 1993).

2.4.3 EVAL(uator)

This can be termed the most important component in the theory because it accounts for all "observable regularities of surface forms. EVAL is structured as a (language-specific) hierarchy of universal constraints" (Kager, 2001: p. 20-21). Constraints hierarchy has a list of the universal constraints and they are arranged based on their language specificity. The EVAL chooses the optimal candidate, that is, the candidate which does not violate the highly ranked constraint and this is chosen as the output. Using the language-specific and -ranked constraints, EVAL considers the candidates. The candidate which does not violate the highest ranked constraint is considered to be the optimal candidate. The number of violations is not the first or most important consideration, rather, it is the violation or not of the highly ranked constraints. The candidate that attracts the smallest number of violations of highly ranked constraints emerges as the optimal candidate. This evaluation of the generated candidates is done in parallel form using a table called tableau.

Summarily, GEN generates all the possible candidates, EVAL selects the harmonic one using CON as the standard for choice (Kager, 2001).

2.4.4 Tableau

Tableau is the table used for analyses of the generated candidates; the constraints occupy the first row of the table while the possible outputs, that is, the candidates, occupy the first

column. The input occupies the first cell in the first row and column, that is, the uppermost left corner of the table (McCarthy, 2007).

There are two types of tableau – the comparative and the violation tableaux; these have their peculiarities and specific functions which distinguish them. In a comparative tableau, each of the cells indicates how often a constraint has been violated and each cell carries a W (winner) or an L (loser) to show whether or not a candidate violates a constraint. In a violation tableau, asterisks (*) are used to indicate violations; asterisks and exclamation marks (*!) are used to indicate a Fatal Violation – this is a violation of the highest ranked constraint, after which no other evaluation is required as an optimal candidate would have been identified. The ranking of constraints is based on a hierarchy of strict domination. This situation is called the *strictness of domination* and it simply means that if a candidate violates only one constraint and this constraint is a highly ranked one, then it has performed worse than a candidate which violates many lower-ranked constraints. Hence, an optimal candidate need not obey all the constraints but the highly-ranked one. An icon of a pointing hand (☞) is used to indicate the optimal candidate. Ranking among the constraints is shown by an unbroken line in the tableau and by ">>" in prosaic form. Some cells in the tableau are usually shaded to show that the violations that occur inside these cells are not important.

> Violation tableaux are not as good as comparative tableaux in showing how the constraints and their ranking function in a particular language. But they are more useful than comparative tableaux for determining which members of a given candidate set are possible winners under different rankings of a given set of constraints.
>
> (McCarthy, 2007: p. 8)

Below are illustrations of what comparative and violation tableaux are as culled from McCarthy (2007)

Tableau 2.1 Comparative tableau **Tableau 2.2 Violation tableau**

/ʔilk-hin/	*Cu	DEP
a. → ʔili**k**hin		1
b. ʔilkhin	W_1	L

/ʔilk-hin/	*Cu	DEP
a. → ʔili**k**hin		*
b. ʔilkhin	*!	

McCarthy, J. J. 2007. What is optimality theory? *Linguistics Department Faculty Publication Series.* Massachusetts: University of Massachusetts Amherst 27.

Tableaux 2.1 and 2.2 present two candidates (‘ʔilikhin’ and ‘ʔilkhin’) as well as two constraints (*Cu and DEP). Each of these candidates violates one constraint each, however, *Cu dominates DEP because it is more highly ranked and this is shown by its appearance on the leftmost part of the column. Candidate (b)’s violation of the more highly ranked constraint (*Cu) is a fatal one, hence candidate (a)’s violation of DEP does not prevent it from being the harmonic candidate of the tableau. The fatality of candidate (b)’s violation is shown with asterisk and exclamation mark (*!). A closer observation of the tableau also shows that the last column has shaded portions – this shows that the violations in these cells are no longer necessary because a fatal violation which proves the optimal candidate has already taken place.

Another tableau presented below to explain some more features which are not captured in McCarthy’s (2007) description.

Tableau 2.3 Illustrative tableau

Input	Constraint 1	Constraint 2	Constraint 3	Constraint 4
a. Candidate 1	*!			*
☞ b. Candidate 2				*
c. Candidate 3		*	*	

Constraints ranking: Constraint 1 >> Constraint 2 >> Constraint 3, Constraint 4

Kager, R. 2001. *Optimality theory*. Cambridge: Cambridge University Press. p. 5.

The styles of line in a tableau are not randomly chosen, instead, each style holds some significance towards the overall analysis in the tableau. First, the single unbroken line between constraint 1 and constraint 2 shows that the first constraint ranks higher than the second. Also, the double and unbroken lines that separate constraints 1, 2 from constraints 3, 4 show that the first two constraints jointly rank higher than the other two constraints. Lastly, the broken line between constraints 3 and 4 shows that neither of them ranks higher than the other. Rather, they are on the same level of ranking. These are represented with the use, or absence as the case may be, of '>>' in the prosaic representation of the ranking. The shaded portions of the tableau show areas where an activity cannot impact the overall outcome of the tableau.

2.4.5 Optimality Theory and phonological processes

McCarthy (1997) reports that Optimality Theory can be a verifiable theory to account for phonological processes; he states that process-specific constraints are available and these are a result of constraint-ranking – a core principle in the theory. The study counters Davis (1995) which asserts that the effects of process-specific constraints are not within Optimality Theory.

Concerning the application of Optimality Theory to children's language use, Shooshtaryzadeh (2015) asserts that at the beginning of language development, children simplify their language use and this prompts the dominance of faithfulness constraints by markedness constraints.

> To produce the correct forms, children should rerank their initial constraint hierarchy during phonological development. To rerank a constraint hierarchy, the markedness constraints is demoted (sent to a lower rank) to the right side of the faithfulness constraints, i.e. IDENT-IO. In this way, the child's language system gradually approximates to the adults' language system during language development.
>
> (p. 16)

Shooshtaryzadeh (2015) goes on to state about children's error patterns that they are derivations from a hierarchy of conflicting universal constraints. Also, Optimality Theory

is endowed with more analytical frameworks to provide more elaborate explanations than the underlying phonological constraints in generative phonology.

2.5 Summary

This chapter of the research has presented the conceptual and empirical review of relevant literature. It also contains a discussion of the theoretical framework that was adopted for the study. In addition, necessary conceptual clarifications were made. The next chapter contains the methodology for the research.

CHAPTER THREE

METHODOLOGY

3.0 Preamble

This chapter presents the methodology that guides the different stages of the research. It provides details about the design of the research, the sampling technique, research instrument, method of data collection, and information about the analysis of the data.

3.1 Research design

The study adopted a descriptive research design. The different types of phonological processes that the children produced were perceived and described, theoretically and acoustically. Descriptive statistics was also used.

3.2 Sampling technique

The purposive sampling method was used in the selection of the participants; this is because participants were mainly selected based on availability, willingness and ability to participate, and their fulfilment of the age criterion (between one and six years old). The age range was a deliberate choice so as to situate the data collection within the period when the phonological processes, as they relate to children, are still being used.

3.3 Sample Size

A total of one hundred schoolchildren were selected from Oyo and Lagos States. These two states were used because of their proximal, cosmopolitan and multicultural features which provided a relatively broad linguistic milieu for a balanced research. Also, these features meant that dialectal variations in these areas were minimal compared to other states in south-western Nigeria. There were seventy-five (75) children from Lagos State and twenty-five (25) from Oyo State.

Also, the utterances of two female children aged one year, three months and four years, three months were sampled for 6 months for a longitudinal observation. This was for the purpose of discovering any language development that occurred over this period of time. The choice of these participants was dictated by their age, availability and an authentication of their medical soundness in terms of speech or cognitive defects. The age range was a purposive choice so as to represent the beginning of utterance production as well as the end of the use of phonological processes as they relate to children.

3.4 Research instrument

The participants read aloud a purposively designed text which contained some phonological processes. There were three sections of short and simple stories, and there were two popular rhymes in the text. A total of two hundred and seventy-five (275) words were in the instrument. Colourful pictures were also inserted in the text to illustrate the stories and rhymes. Words that Nigerian children are found to commonly use were deliberately put into the instrument such as *grandpa, yo-yo, birthday, cake* and so on. This instrument is present in the appendix.

3.5 Ethical approval

The researcher got a letter of introduction from the Head of Department, English and presented it to the administrators of the schools from which the data were collected. Data collection was carried out only after the school had consented to the request. Afterwards, the schools presented the researcher with a letter to attest that some children participated in the data collection process. The letter of consent and attestation was sought and got from the school because the data collection occurred during school hours and the administrators were made to understand the research and academic objective behind the process.

In the case of the longitudinal observation, the parents of the two children consented to allow their children to anonymously participate in the procedure. They wrote and signed a letter of consent to this effect.

3.6 Method of data collection

The one hundred schoolchildren from whom the data were collected, had acquired a reading skill and were made to read aloud a two hundred and seventy-five word-count text. Their renditions of these were audio-recorded.

These elicitations and recordings were carried out by the researcher and a research assistant to aid a faster process of recording. Prior to the commencement of data collection, a brief but effective training was given to the research assistant on the process for the data collection. An average of ten minutes was spent with each child; during this time, each of them was allowed to go through the text before they eventually read it aloud.

An audio-recording application on a mobile phone was used to collect the recordings of the participants while they read aloud the prepared text and poems. Interfering calls and messages during the recordings were forestalled by switching the mobile device to airplane mode. Different rooms were used for the recordings to prevent sound overlap. The rooms were quiet in order to limit background noise to the barest minimum.

For the longitudinal data collection, the younger participant who resided in Oyo State was recorded on an average of four and a half hours per week. The older participant who resided in Lagos State was recorded for an average of thirty minutes on weekdays. These were audio-recordings of her utterances while she conversed with her parents and siblings and played with her friends. These recordings were done in a way that prevented distraction and put the participants in a natural state.

3.7 Method of data analysis

Three major levels of analysis were adopted in the research – perceptual, theoretical and acoustic. These were complemented by descriptive statistical analysis. They were combined to provide a result as genuine and authentic as possible. The recordings of the children's utterances were played back to isolate the different instances of phonological processes. These were grouped into the different types and the frequency of instantiations were noted and converted to percentages. Then, these processes were examined and subjected to analysis using Optimality Theory. The rankings of the different relevant

constraints were presented as found in the grammar of the children. Afterwards, representations of the most prominent patterns were subjected to acoustic analysis using version 6.1.40 of Boersma and Weenink's (2021) PRAAT. The longitudinal data from both participants were transcribed and the converging and unique phonological processes were subjected to theoretical and acoustic analyses.

3.8 Summary

In this chapter, all the details about the design of the research, the sampling technique and sample size have been presented. Also, the necessary information about the research instrument, ethical approval, method of data collection and data analysis has also been included in this chapter. The next chapter contains the data analysis.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION

4.0 Preamble

This section of the research contains the theoretical and acoustic analyses of the data which was gathered from the participants. The data were played back and the different instances of phonological processes were isolated, grouped according to types, quantified using descriptive statistics and analysed theoretically.

4.1 Socio-demographic description of the participants

The tables below show how the participants were distributed based on age, and States. The first table shows the distribution of age, the second shows that of gender, while the third shows their distribution across the two States from where the children were selected.

Table 4.1 Age of the respondents

Distribution of age					
Cross-sectional data			**Longitudinal data**		
Age	**Freq**	**(%)**	**Age**	**Freq**	**(%)**
4 years	19	19.0	1 year, 3 months	1	50.0
5 years	31	31.0	4 years, 3 months	1	50.0
6 years	50	50.0			
Total	**100**	100.0	**Total**	**2**	100.0

As presented in Table 4.1, a total of one hundred children from the cross-sectional data and two children from the longitudinal data participated in the study and their ages ranged from one to six years. In the longitudinal data, one child was one year and three months old, and the other was four years and three months old. In the cross-sectional data, nineteen children were four years old, thirty-one children were five years old, and fifty were six years old.

Table 4.2 Distribution of the participants between the states

	Cross-sectional		Longitudinal		
States	**Freq**	**(%)**	**Freq**	**(%)**	**(%)**
Lagos State	75	75.0%	1	50.0%	50.0
Oyo State	25	25.0%	1	50.0%	50.0
Total	**100**	**100.00**	**2**	**Total**	100.0

In Table 4.2, the frequency and percentages of the children between the two states is presented. The majority of the participants (73.5%) were from two schools in Ifako and Alimosho Local Government Areas of Lagos State, while twenty-five (24.5%) were from a school in Ibadan, Oyo State. One child each was sampled in Lagos and Oyo States; this constituted 1.0% each.

4.2 Phonological processes

Certain structures in the instrument were used to test some processes and the realisations of these structures have been analysed under their respective titles. The tested processes are yod coalescence, substitution, monophthongisation, assimilation, deletion, vowel strengthening and gliding. The other processes found in the data are also analysed in this section.

4.2.1 Coalescence

Miss Jane, second year, grandma's yummy and *last yoyo* were the four structures that were purposively inserted into the instrument to test the participants' yod coalescence. In the instrument, *Miss Jane* occurred 8 times, while the rest occurred once only. Thus, while *Miss Jane* was expected to have a total occurrence of 800, the other structures were expected to have a total occurrence of 100 each. The frequency and percentages of the realisations of this process are presented in the table below.

Table 4.3 Realisation of coalescence in four to six year olds

Process	Instances	Freq	ET	Variants	Frequency			%
					4 years	5 years	6 years	
Coalescence	Miss Jane	8	800	/mizdʒɛn/	86	118	305	63.6
				/misdʒɛn/	57	127	53	29.6
				/misisdʒɛn/	9	14	7	3.8
				/misdʒein/	-	8	16	3.0
	Second year	1	100	/sekɔnjie/	46	13	30	89
				/sekɔndjie/	1	5	5	11
	Grandma's yummy	1	100	/granmazjɔmi/	5	30	40	75
				/granmajɔmi/	18	3	4	25
	Last yoyo	1	100	/lastjojo/	14	39	31	84
				/lasjojo/	8	3	2	13
				/lastjɔjɔ/	3	-	-	3
	A	12	1200	/ɛ/	346	376	406	94
				/ə/	-	46	62	6

Key:

ET: Expected Total

Table 4.3 presents the four variants for *Miss Jane* which were found in the data as produced by the participants. The most frequent variety was /mizʤɛn/ with a total occurrence of 509 (63.6%) out of an expected total of 800. This variety involved a voicing of the coda in the first syllable which can possibly be interpreted as a regressive influence of the voice feature of the voiced palato-alveolar affricate /ʤ/ in the onset of the second syllable. The next variant was /misʤɛn/ with a total of 237 (29.6%). The third variant involved a pronunciation of "Miss" as "Mrs", thus leading to an insertion of /is/ in-between both syllables. Perhaps, this can be interpreted as an oversight on the part of the participants, especially as only a small 3.8% of them enunciated the structure this way. The fourth variant was /misʤein/ and it occurred 24 times in the data, constituting 3.0% of the data.

Thus, the process that can be said to have really occurred here would be yod dropping since the anticipated coalescence did not occur. This is likely the case because of the pace at which the participants enunciated the text. Although they were given some minutes to go through the text before they eventually read it aloud for audio-recording, they still did so at a relatively slow pace of 4.8 minutes per participant on an average. This meant that the sounds did not flow very well into one another as is the context for the production of phonological processes.

Second year was the second structure used to test coalescence among the participants and there were two variants in the participants' rendition. These were /sekɔnjie/ with a frequency of 89 and /sekɔndjie/ with a frequency of 11. The expected total frequency was 100 and a majority of 89 participants removed voiced alveolar plosive /d/ in the coda of the first syllable. The context for an achievement of coalescence involves two different sounds, in this case voiced alveolar plosive /d/ and palatal semivowel /j/, therefore, the removal of the initial phoneme rendered the coalescence unachievable. The other variant (/sekɔndjie/) still retained the two sounds, however, coalescence was not achieved because the words were read out apart, with a brief pause in-between them, as a result of the slow pace with which the participants read the text aloud.

The next structure used to test coalescence was *Grandma's yummy* and two variants of this structure were also found in the data, these were /granmazjɔmi/ and /granmajɔmi/ with a frequency of 75 and 25, respectively. There was a voicing of the morphophoneme for

possession (-s) in the first variant and its total removal in the second variant. Both variants did not enable coalescence because of their pace and the deletion, respectively.

The final structure used to test coalescence was *last yoyo* with voiceless alveolar plosive /t/ and palatal semivowel /j/ providing the context for this process. The variants that the participants produced were /lɑstjojo/, /lɑsjojo/ and /lɑstjɔjɔ/ with a frequency of 84%, 13% and 3%, respectively. The highest occurring variant did not contain coalescence even though the necessary sounds for its occurrence were present. This can be attributed to the care with which majority of the participants read aloud the text despite having gone through it once before. The next variant that occurred frequently was /lɑsjojo/ where voiceless alveolar plosive /t/ was removed, thus, eliminating the chance for coalescence. The last variant was like the first, voiceless alveolar plosive /t/ and palatal semivowel /j/ were still present in the words but, coalescence did not occur. This third variant had 3%.

Thus, all four words of the linguistic structures discussed above did not produce any process of coalescence, because of the careful, emphasised and discrete enunciation by the participants. However, coalescence occurred between half-open front spread vowel /e/ and half-close front spread vowel /i/ in eleven words in the data. These sounds occurred together as closing diphthongs /ei/ in the words in the table, but were rendered as half-close front spread vowel /ɛ/ predominantly across these eleven words.

Therefore, coalescence in Nigerian children's spoken English occurs in diphthongs but not in consonants. The articulation proximity of these vowels instigates this process while this is not the case in consonants' articulation despite articulation proximity.

4.2.2 Substitution

Seven words were purposively used to test the participants' substitution process and these words were *with, the, there, birthday, then, father*, and *this. With* occurred twice in the instrument and the total expected frequency was 200. *The* and *this*, being common words, occurred seven times each in the instrument, and there was an expected total occurrence of 700 tokens in each case. *Birthday* and *father* occurred three and two times, respectively, so there was an expected total occurrence of 300 and 200 in that order. Finally, *there* and *then* occurred once each, and there 100 tokens of occurrence were expected for each word. The table below presents the information at a glance.

Table 4.4 Realisation of substitution in four to six year olds

Process	Instances	Freq	ET	Variants	Frequency			%
					4 years	5 years	6 years	
Substitution	With	2	200	/wit/	38	56	82	88
				/wiθ/	-	6	18	12
	The	7	700	/di/	133	189	315	91
				/ði/	-	28	35	9
	There	1	100	/de/	19	27	43	89
				/ðe/	-	4	7	11
	Birthday	3	300	/bedɛ/	48	60	150	86
				/bɜːθdɜ/	-	9	11	6.7
				/betdɛ/	3	6	10	6.3
				/bɜːθdei/	-	-	3	1
	Then	1	100	/den/	19	30	48	97
				/ðen/	-	1	2	3
	Father	2	200	/fɑdɑ/	37	48	104	94.5
				/fɑːdə/	1	3	3	3.7
				/fɑːðə/	-	-	4	2.0
	This	7	700	/dis/ 682	133	203	346	97.4
				/ðis/ 18	-	14	4	2.6

Key:

ET: Expected Total

Table 4.4 presents the instances of the words used to test the substitution process. The variants of each of these instances are presented too, along with their frequencies and percentages. For the instance of *with*, there were two variants: /wit/ and /wiθ/ with frequencies of 176 and 24, and percentages of 88% and 12% in that order.

The had an expected total occurrence of 700 and there are two variants of this instance. The first is /di/ (637: 91%) and /ði/ which occurs 9% with a frequency of 63. *There* also had two variants which are /de/ and /ðe/. These variants have a percentage occurrence of 89% and 11%, and a frequency of 89 and 11, respectively.

In the case of *birthday* where the expected total occurrence of tokens was 300, there were four variants of the process of substitution and these were /bedɛ/ (86%), /bɜ:θdʒ/ (6.7%), /betdɛ/ (6.3%) and /bɜ:θdei/ (1%). The frequencies of the variants were 258, 20, 19 and 3, respectively. Unlike the previous instances of words used to test substitution, this word has two syllables and has voiceless dental fricative /θ/ and voiced alveolar plosive /d/ occurring side by side. This provided a complex structure for the participants to produce and probably explains the higher frequency of variation, relative to the other instances.

The next word was *then* and there were two variants produced by the participants. These were /den/ (97%) and /ðen/ (3%). Similarly, the tested word *this* also had two variants of /dis/ (97.4%) and /ðis/ (2.6%). *Father* had an expected total occurrence of 200 because it occurred twice in the instrument. Three variants were found in the data: /fɑdɑ/ (94.5%), /fɑ:də/ (3.7%) and /fɑ:ðə/ (2.0%).

Voiced and voiceless dental fricatives /ð θ/ were mainly used to test the process of substitution and despite the extremely varied frequencies of the words, the percentages still reveal a particular pattern of substitution. The table shows that voiced dental fricative /ð/ was predominantly substituted with voiced alveolar plosive /d/, while the voiceless dental fricative /θ/ was mainly replaced with voiceless alveolar plosive /t/. Based on the overall frequencies and percentages in the table, it can be concluded that more Nigerian children substitute voiced dental fricative /ð/ with voiced alveolar plosive /d/, and voiceless dental fricative /θ/ with voiceless alveolar plosive /t/.

4.2.3 Monophthongisation

A total of seventeen words were used to test the process of monophthongisation among the participants. *Gave, Day, Play, Cake, There, Where, Take, Later,* and *Hair* were the nine words used and each occurred once only in the instrument; thus, there was an expected total frequency of 100 tokens per word. *Home, Gate*, and *Away* occurred twice in the instrument, therefore, there was an expected total frequency of 200 tokens for each of the three words. *Rain* occurred 4 times in the instrument, thus, there was an expected total frequency of 400 tokens for this instance. Likewise, *Rose, Jane, I* and *A* occurred 6, 8, 7 and 12 times, respectively in the instrument, so there were expected total frequencies of 600, 800, 700 and 1200, respectively. Table 4.6 below shows the instances, their variants as well as the frequencies and percentages of these variants.

Table 4.5 Realisation of monophthongisation in four to six year olds

Process	Instance	Freq	ET	Variants	Frequency			%
					4 years	5 years	6 years	
Monophthongisation	I	7	700	/ɑi/	126	170	348	92
				/ɑ/	7	21	28	8
	Vine	6	600	/vɑin/	104	182	299	97.5
				/vin/	10	4	1	2.5
	Time	1	100	/tɑim/	19	31	50	100
	A	12	1200	/ɛ/	228	336	564	94
				/ə/	2	34	36	6
	Gave	1	100	/gɛv/	18	28	48	94
				/geiv/	-	3	2	5
				/gɑv/	1	-	-	1
	Day	1	100	/dɛ/	19	28	47	91
				/dei/	-	3	3	6
	Play	1	100	/plɛ/	19	29	46	94
				/plei/	-	2	4	6
	Cake	1	100	/kɛk	19	29	48	96
				/keik/	-	2	2	4
	There	1	100	/de/	18	26	42	86
				/ðe/	1	4	6	11
				/ðeə/	-	1	2	3
	Where	1	100	/we/	19	30	48	97
				/weə/	-	1	2	3
	Take	1	100	/tɛk/	18	30	49	97
				/teik/	1	1	1	3
	Rain	4	400	/rɛn/	72	120	196	97
				/rein/	2	4	6	3
	Home	2	200	/hom/	38	62	98	99
				/həum/	-	-	2	1
	Gate	2	200	/gɛt/	38	58	96	96
				/geit/	-	4	4	4
	Rose	6	600	/roz/	114	186	298	96
				/rəuz/	-	-	2	4
	Jane	8	800	/ʤɛn/	152	240	384	97
				/ʤein/	-	8	16	3
	Later	1	100	/lɛtɑ/	19	29	47	95
				/leitə/	-	1	2	3
				/leitɑ/	-	1	1	2
	Hair	1	100	/he/	19	31	48	98
				/heə/	-	-	2	2
	Away	2	200	/ɑwɛ/	38	55	90	41.5
				/ɑwei/	-	6	8	7
				/əwei/	-	1	2	1.5

Table 4.5 presents the realisation of the process of monophthongisation in each of the instances of the words used in the instrument. The indefinite article *a* occurred most frequently in the instrument with a frequency of 1200. Monophthongisation occurred in 1128 instances (94%), reducing the closing diphthong /ei/ to a half-close front spread vowel /ɛ/. This closing diphthong /ei/ was also reduced to only half-open central neutral vowel /ə/ in 72 instances of the tokens, constituting 6% of the total occurrence. This substitution was a product of the careful and discrete enunciation style that majority of the children employed.

The first person singular pronoun, *I*, had a frequency of 7 in the instrument and an expected total frequency of 700 in the entire data. Monophthongisation occurred in only 8% of the data with a total frequency of 56 out of 700. The majority of the participants retained the closing diphthong /**ɑ**i/ with a frequency of 644 (92%).

Vine and *time* also occurred in the instrument; *vine* occurred six times, while *time* occurred once. Thus, there was an expected total of six hundred and one hundred tokens, respectively for the words. There were two variants for *vine* but only one for *time*. 585 of the tokens for *vine* were produced as /v**ɑ**in/, while 15 were produced as /vin/, giving a percentage occurrence of 97.5% and 2.5%, respectively. As for *time*, all the participants produced it as /t**ɑ**im/, giving 100% for this production.

Gave occurred once in the instrument and there was an expected total of 100 tokens in the data. Three variants of the word were produced and these are /**g**ɛv/ (94%), /**g**eiv/ (5%) and /**gɑ**v/ (1%). Thus, monophthongisation occurred 95% of the time. The 1% occurrence of /**gɑ**v/ is not significant at all, neither is that of /**g**eiv/ which occurred 5% of the time.

Day, *play*, *cake*, and *take* all occurred once each in the instrument and there was an expected total of 100 tokens each for the words. There were two variants for each of the words: /dɛ/ and /dei/; /plɛ/ and /plei/; /kɛk/ and /keik/; and /tɛk/ and /teik/. In the case of *day*, /dɛ/ and /dei/ had a percentage occurrence of 91% and 6%, respectively. In the instance of *play*, the variants /plɛ/ and /plei/ had an occurrence of 94% and 6% in that order. The variants for *cake* were /kɛk/ and /keik/ with 96% and 4%, respectively. *Take* also had two variants, /tɛk/

and /teik/, with respective frequencies of 97% and 3%. All these show a predominance of half-close front spread vowel /ɛ/, a pure vowel that has replaced the closing diphthong /ei/.

Where and *hair* have the same diphthongs and both of them occurred once each in the instrument, so a total of 100 tokens was expected for each of them. Both words contain the centring diphthong /eə/, and monophthongisation occurred to convert /weə/ to /we/ in the case of *where*, and /heə/ to /he/ in that of *hair*. In *where,* the available variants in the data were /weə/ and /we/ with a frequency of 97% and 3%, respectively. A similar variation was observed in *hair* too, where /heə/ and /he/ had a frequency of 98% and 2%, respectively. Thus, monophthongisation was achieved in these diphthongs through a removal of the weaker vowel segment, half-open central neutral vowel /ə/.

Home and *rose* also occurred in the text, *home* occurred twice while *rose* occurred six times in the text. Thus, a total of 200 and 600 tokens respectively were expected in the data. There were two variants in the data – /hom/ and /həum/ with a percentage of 99% and 1%, respectively. Of the 200 expected tokens, /həum/ was produced only twice in the data. Similarly in *rose*, there were two variants – /roz/ and /rəuz/ with a percentage of 96% and 4%, respectively. Monophthongisation occurred in these cases through merging the vowel sounds in some of the diphthongs. For instance, while schwa /ə/ is a central vowel, /u/ is a back vowel, the coalition of these two sounds into one resulted in /o/ whose point of articulation on the tongue is located somewhere between the central and back region.

Rain, gate, Jane, later and *away* all contain the same closing diphthong /ei/. *Rain* occurred four times in the data, thus, there was an expected total frequency of 400 for this token. *Gate* and *away* occurred twice each, therefore, there was a total of 200 tokens expected for each of these words in the data. *Jane* had a frequency of eight words in the data, meaning that each participant was expected to produce the word eight times, resulting in a total frequency of 800 tokens in the entire data. Finally, *later* occurred once only, and there was an expected total of 100 for its frequency in the data.

Rain had two variants in the data – /rɛn/ and /rein/ with a percentage of 97% and 3%, respectively. *Gate* also had two variants with vowel phonemes similar to that of *rain*; the variants for *gate* are /**g**ɛt/ and /**g**eit/ and the percentages of their occurrence are 99% and

1%, respectively. The frequency of occurrence of the second variant is insignificant with only 8 occurrences out of a total of 200. *Jane* also had two variants – /ʤɛn/ (97%) and /ʤein/ (3%). *Later* and *away*, unlike the others, had three variants each. For the word *later*, the variants were /lɛtɑ/, /leitə/ and /leitɑ/ with occurrence of 95%, 3% and 2%, respectively. With these variants however, the vowel phonemes produced had two variants only, a monophthong in the most frequently occurring variant, and a diphthong in the other two variants. So as far as monopthongisation is concerned in this token, there were really two variants of the vowel phoneme, and they are /ɛ/ (95%) and /ei/ (5%). *Away* had three variants which are /ɑwɛ/, /ɑwei/ and /əwei/ with a percentage of 83%, 14% and 3%, respectively. For the treatment of monophthongisation, these variants can be collapsed into two to give a percentage of 83% for /ɛ/ and 17% for /ei/. Thus, monophthongisation prevailed in this instance with 83%.

Therefore, monophthongisation in Nigerian children's spoken English occurs least in /ɑi/. However, /ei/, /əu/ and /eə/ are often monophthongised and this monophthongisation is executed using other processes: coalescence and deletion.

4.2.4 Assimilation

Four linguistic structures were used to test the process of assimilation and these are *of blue, like blue, Jane's home,* and *like this*. *Of blue, like blue*, and *Jane's home* appeared once each in the instrument, meaning that a total of 100 tokens were expected of them each in the data. *Like this*, however, occurred five times in the instrument, thus, a total of 500 tokens were expected in the data. Table 4.7 below shows the instances as well as their variants, frequencies and percentages of occurrence.

Table 4.6 Realisation of assimilation in four to six year olds

Process	Instance	Freq	ET	Variants	Frequency			%
					4 years	5 years	6 years	
Assimilation	Of blue	1	100	/ɔvblu/	10	18	40	68
				/ɔfblu/	5	13	13	31
				/ɔblu/	4	3	1	8
	Like blue	1	100	/laigblu/	16	30	49	95
				/laikblu/	2	1	-	3
				/lakblu/	1	-	1	2
	Jane's home	1	100	/ʤɛnzhom/	17	31	50	98
				/ ʤɛnhom/	2	-	-	2
	Like this	5	500	/laigdis/	52	83	213	69.6
				/laikdis/	28	43	16	17.4
				/laidis/	15	9	41	13

Of blue had three variants these are /ɔvblu/, /ɔfblu/ and /ɔblu/. Of the three variants, /ɔvblu/ had the highest occurrence with a percentage of 68%. The variant /ɔfblu/ occurred with a percentage of 31%. /ɔblu/ was the least occurring variant among the participants and this had a percentage of 8%.

The first and most frequently occurring variant, /ɔvblu/, had the process of assimilation occurring in the coda of its first syllable, where the voiced bilabial plosive /b/ in the onset of the second syllable regressively influenced the voice of the coda in the first syllable. Thus, this changed voiceless labiodental fricative /f/ to voiced /v/. This process occurred 68% of the time. In the case of /ɔfblu/, assimilation as in the first variant did not occur as both syllables were produced slowly and apart from each other. There was an instance of elision of a consonant in the third variant. The elided consonant is the coda of the first syllable – voiced labiodental fricative /v/. So this removed the possibility for an assimilation occurring in this instance.

The next instance is *like blue* and it also had three variants which are /l**ɑ**i**g**blu/, /l**ɑ**ikblu/ and /l**ɑ**kblu/. These had percentages of 95%, 3% and 2%, respectively. In the instance of /l**ɑ**i**g**blu/, the voiceless velar plosive /k/ in the coda of the first syllable (l**ɑ**ik) was influenced in terms of voice by voiced bilabial plosive /b/ which occurred in the onset of the second syllable. Thus, /k/ changed to /**g**/ in the first syllable through the process of assimilation, specifically, regressive assimilation. The other variant was /l**ɑ**ikblu/ with an insignificant percentage occurrence of 3%. In this case, the voiceless feature in the coda (voiceless velar plosive /k/) of the first syllable was retained, thus, there was no assimilation in these 3% occurrences. This was likely as a result of a pause between both syllables. The final variant, /l**ɑ**kblu/, though similar to the second, is missing a vowel so that the diphthong was reduced to a monophthong. The percentage occurrence of this variant is quite insignificant (2%), meaning that only 6 out of 100 participants produced it thus.

Jane's home was the third instance of the linguistic structures used to test assimilation among the participants and it had two variants in the data which are /ʤɛnzhom/ and /ʤɛnhom/. The first variant had an occurrence of 98% while /ʤɛnhom/ had an occurrence of 2%. In the first variant, the morphophoneme for possession (-'s) which occurred between *Jane* and *home* was transformed from a voiceless alveolar fricative /s/ to a voiced alveolar

fricative /z/. This assimilation is best described as progressive, although, argument can also be made for a regressive one. However, a progressive assimilation is a preferred choice because there is already an existing stance in the literature when it comes to morphophonemes and their contexts, that is, the words they are attached to. The voice of the last phoneme to which they are attached to determines the voice that the morphophoneme adopts. Thus, the voiced feature of alveolar nasal /n/ automatically influenced -'s to become voiced. This argument is more established than the existence and influence of the voice feature of glottal fricative /h/ on the morphophoneme -'s. In the second variant however, the morphophoneme for possession was deleted completely; this occurred only 2% of the time.

The final instance used to test assimilation was *like this* and it occurred 5 times in the instrument. There were three variants of production and these are /l**ɑ**i**g**dis/, /l**ɑ**ikdis/ and /l**ɑ**idis/ with a frequency occurrence of 69.6%, 17.4% and 13%, respectively. In the variant /l**ɑ**i**g**dis/, voiceless velar plosive /k/ in the coda of the first syllable was changed to its voiced counterpart /**g**/ because of the influence of the voice feature in voiced alveolar plosive /d/ in the onset of the second syllable. This influence was backward, thus, what occurred there was a regressive assimilation and this occurred in 348 tokens out of the expected total of 500. The second variant was /l**ɑ**ikdis/ and it had a percentage occurrence of 17.4%. Here, the voiceless feature of the coda in the first syllable was retained regardless of the presence of the voiced feature of the onset in the second syllable. Finally, the least occurring variant /l**ɑ**idis/ involved a removal of the coda /k/ in the first syllable so that it became an open syllable. Thus, there was no context for assimilation to occur in this variant. However, this variant was quite insignificant because of its minimal frequency of only 13%.

Therefore, it can be inferred that assimilation in Nigerian children's spoken English occurs both regressively and progressively. Also, voice is a predominant feature that is used in this process of assimilation.

4.2.5 Deletion

There were nine linguistic structures used to test the process of deletion and these are *next, set, grandpa, grandma, and, friends, combed, want,* and *textbooks.* It is necessary to mention that the process of deletion in some of these words were effective because of the contexts in which they occurred, for instance, *and, set* and *want*. That is, the words they occurred with made deletion occur in them. *Set* and *and* occurred twice each in the instrument, thus, 200 tokens were expected for each of these words in the entire data. The other items occurred once each, meaning that 100 tokens were expected of them each. Table 4.8 below shows the instances, their variants, frequencies and the percentages of occurrence.

Table 4.7 Realisation of deletion in four to six year olds

Process	Instance	F	ET	Variants	Frequency			%
					4 years	5 years	6 years	
Deletion	Next	1	100	/neks/	11	26	47	84
				/nes/	5	3	1	9
				/nest/	3	1	1	5
				/nekst/	-	1	1	2
	Set	2	200	/set/	31	54	93	89
				/sed/	3	5	7	7.5
				/se/	4	3	-	3.5
	Grandma	1	100	/**g**ranma/	19	31	50	100
	Grandpa	1	100	/**g**ranpa/	19	31	50	100
	And	5	500	/**ɑ**n/	42	93	190	65
				/**ɑ**nd/	53	62	60	35
	Friends	1	100	/frendz/	4	15	39	58
				/frens/	10	10	9	29
				/frend/	5	6	2	13
	Combed	1	100	/komd/	17	31	50	98
				/komb/	2	-	-	2
	Want	1	100	/wɔn/	11	29	49	89
				/wɔnt/	8	2	1	11
	Textbooks	1	100	/tezbuk/	9	19	40	68
				/tezbuks/	7	4	4	15
				/tekstbuks/	-	5	6	11
				/teksbuk/	3	3	-	6

Next had four variants and these are /neks/, /nes/, /nest/ and /nekst/. It is likely that there were up to four variants because of the number of consonants in the coda of this syllable. The percentages of occurrence of these variants were 84%, 9%, 5% and 2%, respectively. Very few of them (2%) were able to retain all three consonants in the coda of the word, while 9% of them deleted three of these consonants and 5% of them deleted two of these consonants. The most significant variant of all is /neks/ which has the highest percentage occurrence (84%). Here, the final consonant which is voiceless alveolar plosive (/t/) was deleted. In the instrument, the word that occurred after *next* was *to;* this word also begins with a voiceless alveolar plosive. Thus, juncture prosody must be responsible for the high rate of /t/ deletion that occurred in this word.

The second linguistic item was *set* and it occurred twice in the instrument, meaning that a total of 200 tokens of this structure were expected in the whole data. Like the linguistic structure above, that is *next*, this word also occurred close to a consonant. In both cases, *set* occurred before the voiced dental fricative /ð/. In this linguistic structure however, there was only 3.5% of deletion and this involved the voiceless alveolar plosive (/t/) in the coda, while 89% of the tokens retained this consonant. Also, 7.5% of these tokens replaced voiceless alveolar plosive /t/ with its voiced counterpart. The probable explanation for this lies in the context in which this word *set* occurs. Following it, in both cases, was the word *the* /ði/ which was enunciated as /di/ 91% of the time. Thus, the occurrence of the voiceless alveolar plosive /d/ before the voiceless alveolar plosive /t/ can be seen as responsible for the substitution or assimilation of /t/ to /d/ in these 7.5% cases.

The next two words, *grandpa* and *grandma*, are apparently words that the participants were very familiar with as all produced it the same way – deleting the silent letter 'd'. Thus, there was a 100% deletion of /d/ in both cases.

The next word, *and,* occurred five times in the instrument. There were two variants of production in the data and only one of the variants involved a deletion of the final consonant – voiced alveolar plosive /d/, while the other retained it. Thus, /ɑn/ had an occurrence of 65% while /ɑnd/ had an occurrence of 35%. Deletion mostly occurred in the instances where a consonant phoneme occurred after *and,* while /d/ was retained mostly where vowel phonemes occurred after the word. This observation occurred for most, not all of the

scenarios with the participants. The consonant phonemes that occurred after *and* in the data were voiced palato-alveolar affricate /ʤ/, voiced velar plosive /**ɡ**/ and voiced bilabial plosive /b/. The vowel phonemes that occurred after this token were closed diphthong /**ɑ**i/ and close front spread vowel /i/.

Friends was also used to test the process of deletion; this monosyllabic word has two consonant phonemes in its onset and three consonant phonemes in its coda position. Deletion only occurred in the coda, producing three different variants: /frendz/, /frens/ and /frend/ where at least two consonant phonemes were present in each variant, also, alveolar nasal was the constant consonant phoneme that was present in all three variants. These variants had the percentage occurrence of 58%, 29% and 13%, respectively.

Like *grandpa* and *grandma*, *combed* had a clearly preferred variant of /komd/, with a percentage of 98%, while the other variant /komb/ had a percentage of 2%. This variant in the minority occurred as a result of the participants' removal of the regular past tense morpheme, '-ed', which was phonologically represented by voiced alveolar plosive /d/. *Want* occurred once in the data and had two variants in the participants' production which were /wɔn/ and /wɔnt/ with 89% and 11% occurrence, in that order. Thus, there was a high percentage of deletion in this word by the participants.

The final word used to test deletion process was *textbooks* and there are two syllables in this word. The first syllable has one consonant phoneme in its onset and three consonant phonemes in its coda, while the second syllable has one consonant phoneme in its onset and two consonant phonemes in its coda. Deletion affected the codas of the two syllables while their onsets were intact. There were four variants of this structure and these are /tezbuk/ (68%), /tezbuks/ (15%), /tekstbuks/ (11%) and /teksbuk/ (6%). The most prominent variant is /tezbuk/ with 68% and it involved a reduction of the consonant phonemes in the codas to only one each. Also, the consonant phoneme in the coda of the first syllable changed from voiceless alveolar fricative /s/ to its voiced counterpart /z/ and the latter was retained instead as the sole consonant phoneme in the first coda of the word. It is important to note that this instance shows the deletion of another morphophoneme, this time that of plurality. Generally, the actual total of participants who deleted morphophonemes in this token was 74%. In summary, Nigerian children used deletion

process to permit juncture prosody, reduce consonant clusters and get rid of some morphophonemes in their spoken English.

4.2.6 Vowel strengthening

The three central vowels /ɜ: ə ʌ/ were used to test the process of vowel strengthening, and the following words were employed to this effect: *sun, water, bud, cut, up, mum, us, our, month, little, away* and *birthday*. All these linguistic items appeared once each in the instrument, except *our* which appeared five times, *away*, which appeared twice and *birthday* which appeared three times. Table 4.9 below shows the linguistic items and their variants, as well as their frequencies and percentages of occurrence.

Table 4.8 Realisation of vowel strengthening in four to six year olds

Process	Instance	Freq	ET	Variants	Frequency			%
					4 years	5 years	6 years	
Vowel strengthening	Sun	1	100	/sɔ:n/	19	30	48	97
				/sʌn/	-	1	2	3
	Water	1	100	/wɔtɑ/	19	31	48	98
				/wɔtə/	-	-	2	2
	Bud	1	100	/bɔd/	14	29	48	91
				/bud/	5	2	-	7
				/bʌd/	-	-	2	2
	Cut	1	100	/kɔ:t/	19	30	48	97
				/kʌt/	-	1	2	3
	Up	1	100	/ɔp/	19	31	48	98
				/ʌp/	-	-	2	2
	Mum	1	100	/mɔm/	19	29	48	96
				/mʌm/	-	2	2	4
	Us	1	100	/ɔs/	19	29	48	96
				/ʌs/	-	2	2	4
	Our	5	500	/ɑwɑ/	95	135	230	80
				/ɑuə/	-	20	20	20
	Month	1	100	/mɔ:nt/	19	28	42	89
				/mʌnt/	-	3	6	9
				/mʌnθ/	-	-	2	2
	Little	1	100	/litu/	17	27	48	91
				/litul/	3	3	-	6
				/litəl/	-	1	2	3
	Away	2	200	/ɑwei/	2	1	4	3.5
				/ɑwɛ/	36	61	92	94.5
				/əwei/	-	-	4	2
	Birthday	3	300	/bedɛ/	51	75	132	86
				/bɜ:θdɜ/	-	7	13	6.7
				/betdɛ/	6	10	3	6.3
				/bɜ:θdei/	-	1	2	1

Sun, cut, up, mum, and *us* all occurred once each in the data and all had two variants each. There is more uniformity to these words than just the number of their variants. They all

contain open central neutral vowel /ʌ/ which was replaced by an open back rounded vowel /ɔ/. Although they all had varying percentages, the clearly predominant variants contain /ɔ/ all through. For instance, the variants of *sun* are /sɔn/ (97%) and /sʌn/ (3%); the variants of *mum* are /mɔm/ (96%) and /mʌm/ (4%).

Bud also contains the open central neutral vowel /ʌ/ and appeared once in the instrument, but three variants of this item were found in the data. The variants are /bɔd/ (91%), /bud/ (7%) and /bʌd/ (2%). It appeared that a few of the participants were unfamiliar with this word *bud*, and this was detected because of their longer pause before the production of this word. Thus, it is proposed that the unfamiliarity with the word may have prompted 7% of participants to replace the peak in the word with a close back rounded vowel /u/, instead of the open central neutral vowel /ʌ/. Considering this explanation, it is proposed that /ʌ/ is generally strengthened till it becomes /ɔ/ because 91% of the participants did this.

Our /ɑuə/ is a triphthong which ends in schwa. *Our* occurred five times in the instrument, thus, there was a total of 500 expected tokens in the data. There were two variants of this item and these are /ɑwɑ/ (80%) and /ɑuə/ (20%); thus, the third vowel phoneme in the triphthong, open central neutral vowel /ə/, was strengthened till it became an open front vowel (/ɑ/).

The open central neutral vowel /ʌ/ in *month* was strengthened till it became an open back rounded vowel /ɔ/ and this occurred 89% of the time in the data. Although there were three variants produced by the participants, the other two variants differed only in the aspect of the coda, their peaks were retained and un-strengthened.

Little also had three variants, however, as far as vowel strengthening is concerned, there were really only two variants which involved the close back rounded vowel /u/ and the close central neutral vowel 11 /ə/. Thus, the variants and their percentages are /litu(l)/ 97% and /litəl/ 3%.

Away appeared twice in the instrument and had three variants in the data which are /ɑwei/, /ɑwɛ/ and /əwei/. Their percentages of occurrence were 94.5%, 3.5% and 2%, respectively. So technically, and where it concerned the current process, vowel strengthening occurred 98% of the time.

Birthday occurred three times in the instrument, thus, there was an expected total of 300 tokens in the data. There were four variants and these are /bedɛ/ (86%), /bɜ:θdʒ/ 6.7%), /betdɛ/ (6.3%) and /bɜ:θdeɪ/ (1%). In all, 92% contained strengthened vowels which changed from half-close central neutral vowel /ɜ:/ to half-open central neutral vowel /e/.

Therefore, it can be concluded that Nigerian children strengthened their central vowels. Specifically, half-open central neutral vowel /ə/ was strengthened into open front spread vowel /**ɑ**/; half-close central neutral vowel /ɜ:/ was strengthened into half-open front spread vowel /e/, and open central neutral vowel /ʌ/ was strengthened to open back rounded vowel /ɔ/.

4.2.7 Gliding

Gliding occurred mainly in the word *our* which occurred five times in the instrument, thus, a total of 500 tokens existed for this word in the data. Two variants of this linguistic structure were produced and they are /**ɑ**w**ɑ**/ and /**ɑ**uə/ with frequencies of 80% and 20% respectively. In other words, gliding occurred 80% of the time where close back rounded vowel /u/ glided into the bilabial semivowel /w/.

4.3 Constraints ranking for processes

This section of the chapter contains the Optimality theoretical analysis of the instances of the processes that have been discussed in the previous section. The constraints rankings responsible for each emergence are presented in the different tableaux.

4.3.1 Constraints ranking for coalescence

Five structures were used to test yod-coalescence among the participants and these structures were *Second year*, *Grandma's yummy*, *last yoyo, a* and *Miss Jane*. All the structures occurred once only except *a* and *Miss Jane* which occurred 8 and 12 times, respectively. Thus, a total of 100 tokens were expected of all the structures except *a* and *Miss Jane,* for which a total of 1,200 and 800 tokens, respectively, were expected. Coalescence was predominantly dropped by the participants, and *Second year* is theoretically analysed in the next paragraph.

4.3.1.1 Realisation of *second year*

In the production of *second year*, there were two variants discovered in the data and these are /sekɔnjie/ with a percentage of 89% and /sekɔndjie/ with a percentage of 11%. The Received Pronunciation (RP) variant of the utterance and its variants among the participants have been adopted as the candidates for analysis in Tableau 4.1 below.

Tableau 4.1 Emergence of /sekɔnjie/ "second year"

Second year /sekɔnd jie/	**UNIF**	***COMPLEX**	**MAX**
a. /sekɔnd jie/		*	
☞b. /sekɔn jie/			*
c. /sekəndʒie/	*!		

Constraints ranking: UNIF » *COMPLEX » MAX

UNIFORMITY: No coalescence (It penalises segmental coalescence. No element of S_2 has multiple correspondents in S_1) (Wheeler, 2005: p. 62)

*COMPLEX: A syllable has no more than one consonant in a margin (Wheeler, 2007:3)

MAX: No deletion (Every phoneme in the base should have a correspondent in the output) (Wheeler, 2007:3)

There are three candidates and three constraints in the tableau. Two of the candidates are variants from the data while the third is an RP variant which contains a yod-coalescence. The first constraint (UNIFORMITY) is the highest ranked in the tableau and it prohibits any form of segmental coalescence. Candidate (c) violates this constraint by merging voiced alveolar plosive /d/ with palatal semivowel /j/ into a coalesced voiced palato-alveolar affricate /ʤ/. Because constraint 1 is the highest ranked, this violation is a fatal one and the option for a harmonic candidate shifts to either of candidates (a) or (b).

Constraint 2 prohibits the presence of more than one consonant in the margin of a syllable; thus, the presence of alveolar nasal /n/ and voiced alveolar plosive /d/ in the coda of the second syllable in candidate (a) violates this constraint. Therefore, candidate (b) emerges as the optimal candidate because of these violations by candidates (a) and (c). Thus, the cells under constraint 3 are shaded grey because regardless of the violations that occur under this constraint, the emergence of candidate (b) cannot be affected. In other words, candidate (b)'s violation of the third constraint (MAX) does not deter it from maintaining its position as the harmonic candidate.

4.3.1.2 Coalescence of /e/ and /i/

Coalescence occurred in two adjacent sounds half-open front spread vowel /e/ and half-close front spread vowel /i/. These phonemes occurred together as diphthongs in one tested word (*a*), as well as some other nine words in the instrument: *gave, day, play, cake, take, rain, gate, later* and *away.* In the production of these structures, there were significant percentages of coalescence in the diphthongs. *A* and *gave* had 94% of coalescence each. *Day, play* and *cake* had 91%, 94% and 96% of coalescence, respectively. *Take* and *rain* both had a 97% occurrence of coalescence in their diphthongs. *Gate, later* and *away* had

96%, 97% and 95% of coalescence, in that order. The indefinite article “A” is analysed in the tableau below.

Tableau 4.2 Emergence of /ɛ/ "A"

A /ei/	*COMPLEX^{VOW}	*SCHWA	UNIF
a. /ei/	*!		
☞b. /ɛ/			*
c. /ə/		*	

Constraints ranking: *COMPLEX^{VOW} » *SCHWA » *COMPLEX

*COMPLEX^{VOW}: No string of vowels within a syllable (Green, 2010: p. 101)

*SCHWA: the realisation of a central vowel is banned (Wheeler, 2007: p. 8)

UNIFORMITY: No coalescence (No element of S_2 has multiple correspondents in S_1) (Wheeler, 2005: p. 62)

The tableau contains three candidates and constraints each. The highest ranked constraint is *COMPLEX^{VOW} and it prohibits the occurrence of complex vowels, that is, diphthongs and triphthongs. In this case, there is a diphthong in the first candidate, thus, candidate (a) has violated constraint 1, and this violation is a fatal one. Also, constraint 2 prohibits the realisation of a central vowel and the presence of half-open central neutral vowel /ə/ as candidate (c) violates this constraint. These violations lead to the emergence of candidate (b) as the optimal candidate. This emergence is not prevented by candidate (b)'s violation of the third constraint which prohibits any form of segmental coalescence. However, coalescence is exactly what has occurred in candidate (b) where half-open front spread vowel /e/ and half-close front spread vowel /i/ have merged into one segment /ɛ/.

4.3.1.3 Representative acoustic analysis of coalescence in /ɛ/

To illustrate coalescence in /ɛ/, three PRAAT spectrogram images have been used to present the formant frequencies of the two vowel sounds (/e/ and /i/) which merged into a single one (/ɛ/). These images are presented and discussed below.

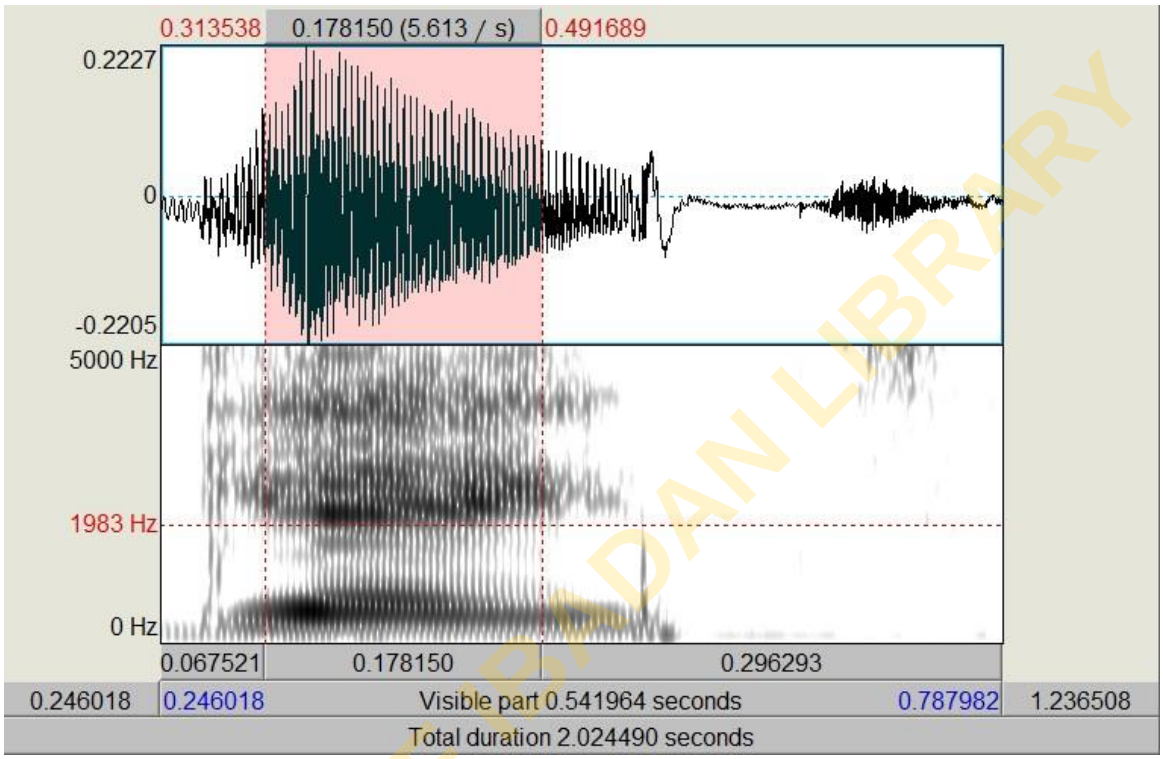


Fig. 4.1 Acoustic illustration of /e/ in /geit/ by a six-year-old

In the acoustic illustration of half-open front spread vowel /e/ above, the four different formant frequencies of the sound are presented, however, only the average of the first two formants are relevant to this analysis and these are 602.26Hz and 1675.35Hz for the first and second formants, respectively. The first formant of this phoneme is conspicuously higher than that of the next sound (half-close front spread vowel /i/) and this presents evidence for a more open articulation of the current vowel phoneme /e/. The lesser value for the second formant frequency in /e/ presents proof that place of articulation is not as close to the front of the mouth as it is in /i/. One of the participants whose production of this vowel segment was representative enough of the majority of the productions found in the data was used for this acoustic analysis. The next figure presents an acoustic illustration of her production of /i/.

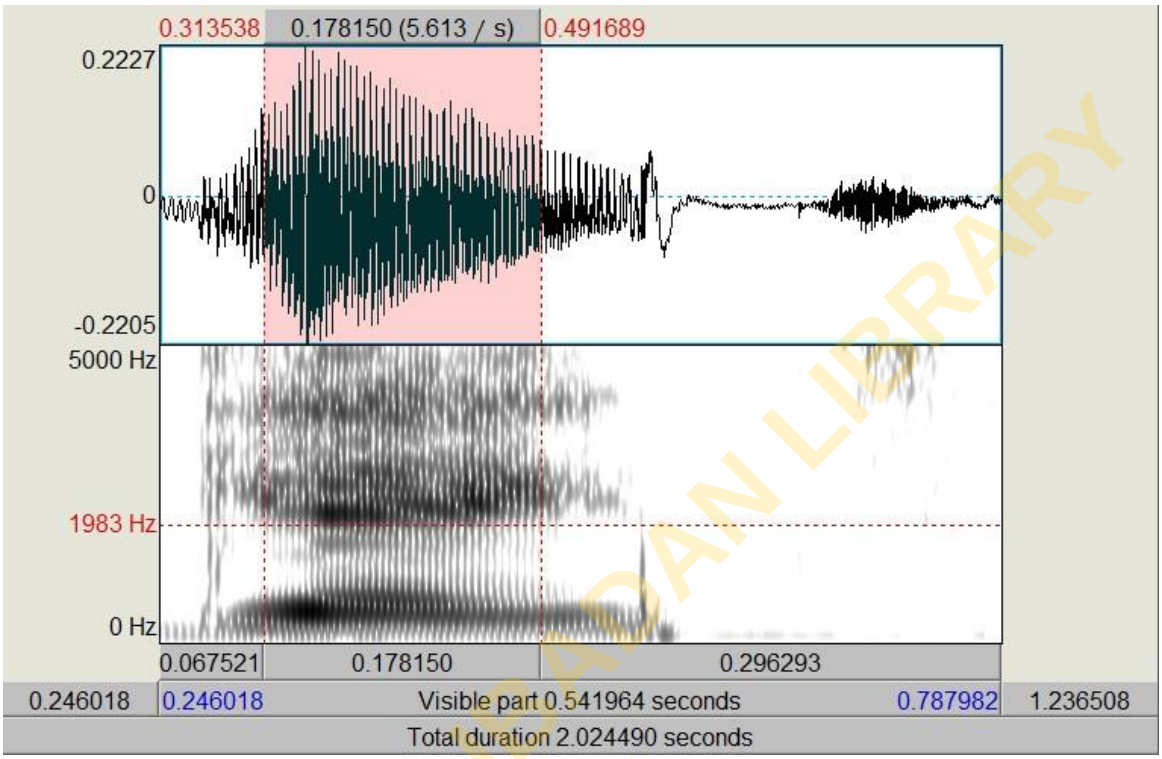


Fig 4.2 Acoustic illustration of /i/ in /geit/ by a six year old

The figure presents the formant frequencies for half-close front spread vowel /i/, where the average of the first formant frequency is 392.58Hz and the average of the second formant frequency is 2839.09Hz. These averages were automatically generated for approximate accuracy. The low value of the first formant frequency shows that articulation is more closed than open, while the very high second formant frequency shows that the articulation of the vowel occurred at the frontal region of the tongue.

The average of the first and second formant frequencies of both segments are presented and plotted on an acoustic vowel chart below to show their places on the chart as well as the occurrence of the coalescence between both sounds. To situate the coalesced segment on the acoustic chart, its first and second formant frequencies were collected and used. This is presented in figure 4.3 below. The first and second formant frequencies for /ɛ/ are 472.63Hz and 2359.92Hz, respectively. Along with the formant values for /i/ and /e/, these values are also plotted on the chart below.

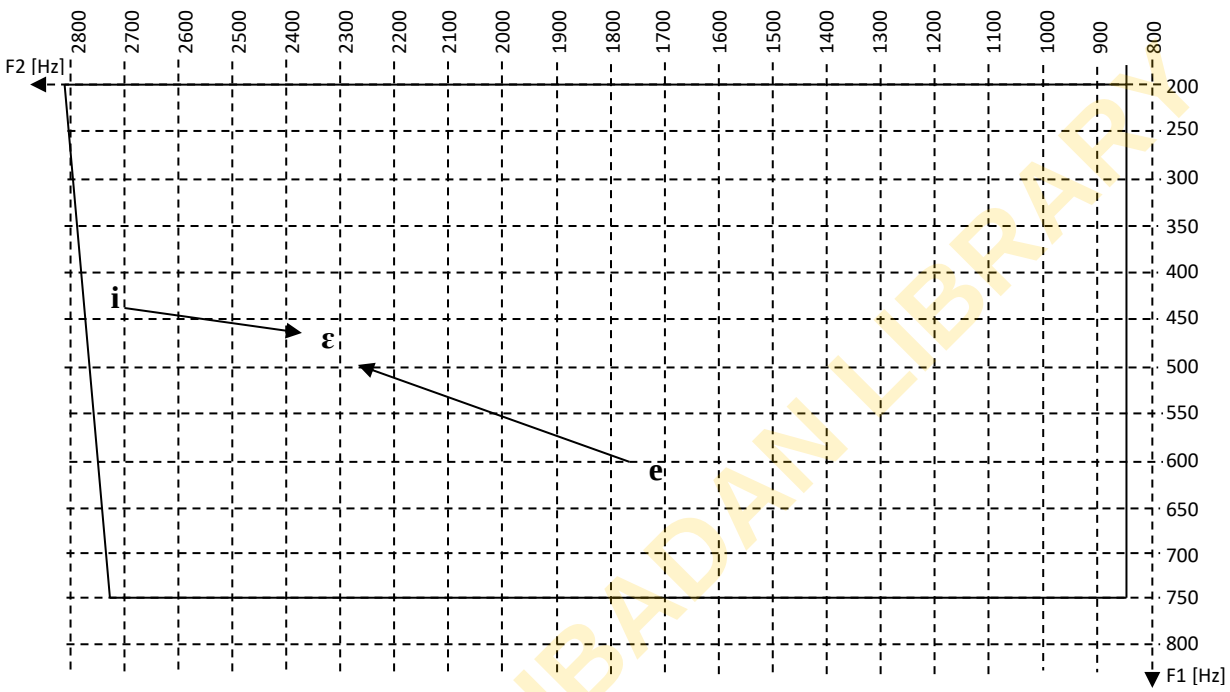


Fig. 4.3 Acoustic vowel chart for coalescence in /ɛ/ by a four-year-old

The segments have been plotted unto the acoustic vowel chart using their first and second formant frequencies and from the positions of the three segments. It is conspicuous that half-close front spread vowel /i/ and half-open front spread vowel /e/ have undergone a movement towards each other to form a new sound which is central to both of them. This sound is /ɛ/ and its first and second formant frequencies are located somewhere between those of /i/ and /e/. The arrows from both sounds have been used to portray a more vivid representation of the coalescence. It is also necessary to state that /i/ as produced here is much more frontal than found in the English or cardinal vowel chart.

4.3.2 Constraints ranking for substitution

For the process of substitution, the research instrument was used to test voiceless and voiced dental fricatives (/θ/ and /ð/) in different parts of a syllable and word. In *birthday*, voiceless dental fricative (/θ/) is located in a coda within a disyllabic word, while in *with*, it is located in the coda of a monosyllabic word. Also, voiced dental fricative (/ð/) was tested in the onset of a monosyllable, *the*, and in an onset within a disyllabic word, *father*. This is the motivation for the theoretical analysis of these four instances in the subsequent paragraphs and tableaux.

Also, one instance of the process of substitution has been presented from the longitudinal data and this is *thing*. This instance contains voiceless dental fricative /θ/ in the onset of its syllable and has been theoretically analysed in this section as well.

4.3.2.1 Realisation of *birthday*

The theoretical explanation for the emergence of *birthday* /bedɛ/ in the data is produced below. This variant had a percentage occurrence of 86%; this makes it the predominant variant in the data. The other variants were /bɜːθdʒ/, /betdɛ/ and /bɜːθdei/ with percentage occurrences of 6.7%, 6.3% and 1%, respectively. Thus, the emergence of /bedɛ/ is analysed in the tableau below.

Tableau 4.3 Emergence of /bedɛ/ "birthday"

Birthday /bɜ:θdeɪ/	*SCHWA	NODIPHTHONG	*C]$_{\sigma}$	*FRICATIVE	MAX
a. bɜ:θdei	*!	*!	*!	*	
b. bɜ:tdeɪ	*!	*!	*!		
c. betdei		*!	*!		
d. betdɛ			*!		*
☞ e. bedɛ					*

Constraints ranking: *SCHWA » NODIPHTHONG » *C]$_{\sigma}$ » *FRICATIVE » MAX

*SCHWA: the realisation of a central vowel is banned (Wheeler, 2007: p. 8)

NODIPHTHONG: diphthongs are prohibited (Green, 2010: p. 101)

*C]$_{\sigma}$: Syllables must not have codas (Borowsky, 1989: p. 146)

*FRICATIVE – Segments may not be [+cont, –son] (Pater and Barlow, 2003: p. 492)

MAX – No deletion (Every phoneme in the base should have a correspondent in the output) (Wheeler, 2007: p. 3)

There are five constraints in Tableau 4.3, and these constraints affect the candidates unequally because the constraints rank differently based on the level of the prevalent hierarchy in the participants' phonology. The unbroken lines between the constraint columns show the hierarchy that exists among these constraints. GEN has generated five candidates for evaluation, and four of these are variants of what was produced by the participants. The first two candidates (a) and (b) violate *SCHWA, the first constraint, because of the presence of half-close central neutral vowel (/ɜ:/) in them. These two candidates also violate constraints 2 and 3 which are NODIPHTHONG and *C]$_{\sigma}$ because of the presence of diphthongs and codas which the constraints prohibit, respectively. These violations are fatal and so this rules out the possibility of emergence of either of these two candidates as an optimal candidate. Candidate 1 also violates constraint 4 because of the presence of a fricative in it, particularly voiceless dental fricative /θ/ which the constraint prohibits.

Furthermore, candidate (c) violates constraints 2 and 3 because of its retention of a diphthong and a coda, respectively. Candidate (d) violates constraints 3 and 5 as a result of the presence of a closed syllable and the absence of a segment that had been there in the input phase. Constraint 5 prohibits the deletion of any segment, thus, candidates (d) and (e) have violated this constraint. Candidates (a) to (d) have fatally violated at least one constraint, while candidate (e) has incurred the violation of a lowly ranked constraint. Thus, candidate (e) emerges as the harmonic candidate in the tableau. In this candidate, there is no diphthong, central vowel or coda as dictated by the higher ranked constraints in the participants' phonological grammar.

This pronunciation of *birthday* as /bedɛ/ is not unique to these participants; rather, it is a typical pronunciation found among some Nigerian speakers of English. This shows that the participants already acquired their ambient language to a great extent. Another instance of substitution is analysed in Tableau 4.4 below.

4.3.2.2 Realisation of *with*

The Optimality theoretical analysis for the realisation of *with* as /wit/ is carried out in Tableau 4.4 below. Two variants emerged from this structure and these are /wit/ and /wiθ/ with percentage occurrences of 88% and 12%, respectively. Thus, the emergence of the predominant variant is analysed in the tableau below. These two variants constitute the generated candidates in the input of the tableau.

Tableau 4.4 Emergence of /wit/ "with"

With /wɪθ/	*FRICATIVE	IDENT(PLACE)	IDENT(MANNER)
a. /wiθ/	*!		
☞b. /wit/		*	*

Constraints ranking: *FRICATIVE >> IDENT(PLACE), IDENT(MANNER)

*FRICATIVE: Segments may not be [+cont, –son] (Pater and Barlow, 2003: p. 492)

IDENT(PLACE): Assign one violation mark for every place feature in the input that is different from its corresponding place feature in the output (Lamont, 2015: p. 54)

IDENT(MANNER): Assign one violation mark for every manner feature in the input that is different from its corresponding manner feature in the output (Lamont, 2015: p. 54)

The tableau has two candidates and three constraints. The first constraint (*FRICATIVE) prohibits the occurrence of any fricative in a structure; thus, the presence of voiced dental fricative (/θ/) in the coda of candidate 1 violates this very high ranking constraint. This single violation leads to the emergence of the second candidate as the optimal candidate. This explains the grey shading in the rest of the tableau. It shows that regardless of what violations or obedience to other constraints that happen in this grey part of the tableau, the emergence of the optimal candidate can no longer be affected. The ranking of these constraints also shows that constraints 2 and 3 occupy the same level of hierarchy while constraint 1 is ranked higher than them both. This is represented by the double lines between constraints 1 and 2, and the dotted lines between constraints 2 and 3. The presence of >> between the first and second constraints as well as the lack of it between the second and third constraints in the prosaic representation of the constraints is an indication of this hierarchy. Thus, despite the fact that the optimal candidate violates the other two constraints, it still retains its optimal status in the tableau. Candidate 2 is able to prevent violation of the high ranking constraint by changing its fricative to a plosive which is permitted in the ranking of these constraints.

Generally, the fricative in this input is one that is often substituted even in these participants' ambient language. Therefore, the reranking of constraints in favour of a plosive instead of this fricative can be said to be motivated, not just by difficulty, but also by imitation.

4.3.2.3 Realisation of *the*

In the instrument, four of the linguistic structures used to test substitution had similar structures as well as the same consonant phoneme in their onsets; therefore, only one of them has been analysed theoretically. These words are *the, there, then,* and *this.* Also, the

same voiced alveolar plosive /d/ was used to substitute the voiced dental fricative /ð/ in these words. Thus, the Optimality theoretical analysis for the realisation of *the* as /di/ is carried out in Tableau 4.5 below. There are two variants for this structure and these are /di/ and /ði/ and the percentage of their occurrences are 91% and 9%, respectively, thus, the emergence of the predominant variant is analysed in the tableau below. The two variants are part of the generated candidates in the input of the tableau.

Tableau 4.5 Emergence of /di/ "the"

The /ðə/	*FRICATIVE	*SCHWA	IDENT(PLACE)	IDENT(MANNER)
a. /ðə/	*!	*!		
b. /də/		*!	*	*
c. /ði/	*!			
☞d. /di/			*	*

Constraints ranking: *FRICATIVE, *SCHWA >> IDENT(PLACE), IDENT(MANNER)

*SCHWA: The realisation of a central vowel is banned (Wheeler, 2007: p. 8)

*FRICATIVE – Segments may not be [+cont, –son] (Pater and Barlow, 2003: p. 492)

IDENT(PLACE): Assign one violation mark for every place feature in the input that is different from its corresponding place feature in the output (Lamont, 2015: p. 54)

IDENT(MANNER): Assign one violation mark for every manner feature in the input that is different from its corresponding manner feature in the output (Lamont, 2015: p. 54)

The tableau contains a substitution of voiced dental fricative (/ð/) with voiced alveolar plosive (/d/). GEN generates four candidates and these are evaluated using four different constraints. Constraints 1 and 2 are more highly ranked than constraints 3 and 4 in the tableau. Also, while constraints 1 and 2 are on the same level of hierarchy, constraints 3 and 4 are also on the same level of hierarchy. These rankings are shown by the broken lines between constraints 1 and 2, and constraints 3 and 4. Thus, the violation of constraints 1 and 2 by candidate (a) to (c) prove to be fatal because both constraints are ranked on the same level in the tableau. These candidates contain fricative, schwa or both, and these are the conditions that both constraints prohibit. These violations leave candidate (d) to emerge as the harmonic candidate despite its violation of constraints 3 and 4 which are faithfulness constraints. These constraints prohibit any kind of change of feature or phoneme between the input and output.

Generally also, these phonemes (/ð/ and /ə/) have proven to be quite problematic for both young and adult speakers of English in Nigeria; thus, it is no surprise that the constraints which prohibit these phonemes are ranked highly by the participants.

4.3.2.4 Realisation of *father*

The last word used to test substitution is *father* and although it also contains the voiced dental fricative /ð/, this phoneme occurs word-medially. It is analysed in a tableau to establish the constraints ranking responsible for its emergence as /fɑdɑ/. There were three variants of *father* in the production of the participants and these are /fɑdɑ/, /fɑ:də/ and /fɑ:ðə/; their percentages of occurrence are 94.5%, 3.7% and 2.0, respectively. These three variants are presented as candidates in the tableau below.

Tableau 4.6 Emergence of /fɑdɑ/ "father"

Father /fɑːðə/	***SCHWA**	**IDENT(PLACE)**	**IDENT(MANNER)**	***FRICATIVE**
a. /fɑːdə/	*!	*	*	*
☞b. /fɑdɑ/		*	*	*
c. /fɑːðə/	*!	*		*

Constraints ranking: *SCHWA >> IDENT(PLACE) >> IDENT(MANNER) >> *FRICATIVE,

*SCHWA: The realisation of a central vowel is banned (Wheeler, 2007: p. 8)

IDENT(PLACE): Assign one violation mark for every place feature in the input that is different from its corresponding place feature in the output (Lamont, 2015: p. 54)

IDENT(MANNER): Assign one violation mark for every manner feature in the input that is different from its corresponding manner feature in the output (Lamont, 2015: p. 54)

*FRICATIVE – Segments may not be [+cont, –son] (Pater and Barlow, 2003: p. 492)

There are two candidates and four constraints in Tableau 4.6. The first candidate has fatally violated constraint 1 which prohibits central vowels. The other three constraints are violated by both candidates but these constraints are not as highly ranked as *SCHWA so the violations are not fatal.

Constraints 2 and 3 are faithfulness constraints that require faithfulness of output to input in terms of place and manner of articulation. The replacement of voiced dental fricative /ð/ with voiced alveolar plosive /d/ in both candidates means that they have both violated these constraints. However, these constraints are not as highly ranked as constraint 1, so the candidates' violation of them is not fatal. The fourth constraint, *FRICATIVE, prohibits the presence of a fricative in a structure and since both candidates have voiceless labiodental fricative /f/ as the consonant in their onsets, they have both violated this constraint. However, like constraints 2 and 3, this constraint is not highly ranked, so its violation by both candidates in the tableau does not affect the emergence of candidate 2 as the optimal candidate.

4.3.2.5 Realisation of *thing*

This word has been introduced from the longitudinal data and its production presents an illustration of the substitution of voiceless dental fricative /θ/ with voiceless alveolar plosive /t/ in the onset of the syllable. This process is analysed theoretically in the tableau below.

Tableau 4.7 Emergence of /tin/ "thing"

Thing /θin/	*F-ONS	*FRICATIVE	IDENT(PLACE)	IDENT(MANNER)
a. /θin/	*!	*		
☞b. /tin/			*	*

Constraints ranking: *F-ONS » *FRICATIVE » IDENT(PLACE), IDENT(MANNER)

*F-ONS: Fricatives are prohibited from occupying an onset position in a syllable (Pater and Barlow, 2003: p. 492)

*FRICATIVE: Segments may not be [+cont, –son] (Pater and Barlow, 2003: p. 492)

IDENT(PLACE): Assign one violation mark for every place feature in the input that is different from its corresponding place feature in the output (Lamont, 2015: p. 54)

IDENT(MANNER): Assign one violation mark for every manner feature in the input that is different from its corresponding manner feature in the output (Lamont, 2015: p. 54)

The tableau contains two candidates and four constraints. The last two constraints occupy the same hierarchical rank, hence, the dotted lines separating the third and fourth rows of the constraints. The first and most highly ranked constraint prohibits the occurrence of a fricative as the onset of a syllable and the presence of voiceless dental fricative /θ/ in the onset of the first candidate fatally violates this constraint. This candidate also violates constraint 2 which prohibits the occurrence of a segment that is fricative.

The other two constraints prohibit any change in the place or manner of articulation of the correspondent segments in the input and output phases. Thus, the substitution of voiceless dental fricative /θ/ with voiceless alveolar plosive /t/ has changed the place and manner of articulation of the segment from dental and fricative to alveolar and plosive, respectively. In this way, candidate (b) has violated constraints 3 and 4.

However, these constraints are not as highly ranked as the first two constraints in the tableau, therefore, candidate (b)'s violation of them is not fatal and it still emerges as the optimal candidate in the tableau.

Generally and across the data, it is noticed that the dental fricatives /θ ð/ are substituted with alveolar plosives /t d/ respectively. The instance found in the longitudinal data above complements this finding too.

4.3.2.6 Representative acoustic analysis of substitution

There are two segment substitutions in the data and these concern the voiced and voiceless dental fricative (/ð θ/) with voiced and voiceless alveolar plosives (/d t/), respectively. One acoustic illustration for each of these substitutions has been carried out in the subsequent paragraphs; *with* and *the* have been used for this purpose.

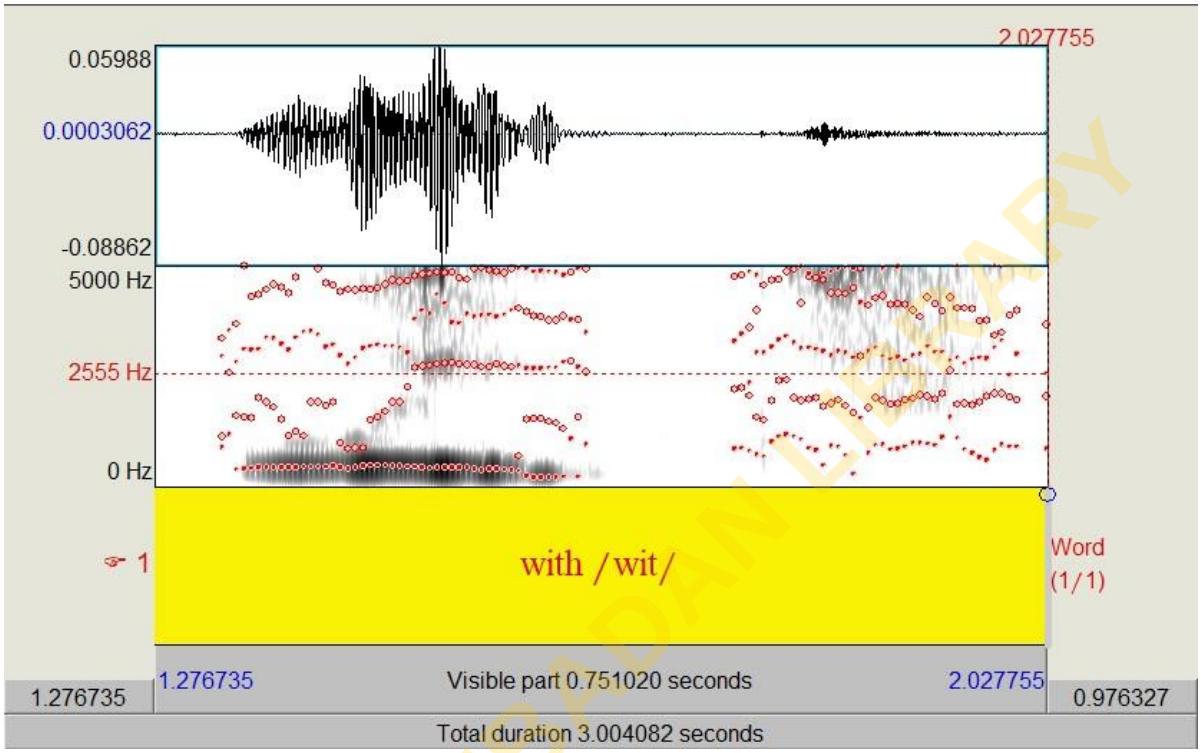


Fig. 4.4 Acoustic illustration of substitution in /wit/ "with" by a five-year-old

The segment under analysis in the acoustic illustration above is a consonant sound, specifically, a voiceless alveolar plosive /t/ which now occupies the position of coda in the analysed structure above. The acoustic features of this sound are highlighted in this analysis. The waveforms and the spectrograms are clearly separated into two different portions and these are the onset and peak (/wi/) in one portion, and the coda (/t/) in the other portion. There is evidence that the first group of spectrogram and waveforms represent /wi/ because bilabial semivowel /w/ shares some acoustic features with vowels and these features are represented by pseudo formants in acoustic analysis. Therefore, the absence of other formants for this first sound proves that it only has some semblance to a vowel, but is not really a vowel phoneme.

Thus, the presence of a first formant of about 300Hz from 1.27 seconds to about 1.54seconds is a representation of the first two sounds in this structure. There is an increase of the second formant from about 500Hz to 2555Hz towards 1.27seconds and this sudden increase in the second formant is an indication that the articulation of that sound is close to the lips – it is a front vowel. Also, the value of F_1 at about 300 to 400Hz shows that the lips are more closed than open. Thus, the vowel that fits into these acoustic descriptions is /i/.

Finally, there is a portion of silence between the first visible groups of spectrogram and waveforms and the second. This portion of silence is an acoustic feature of plosives, which typically have a brief pause before an outburst of acoustic energy. This portion of silence is represented by the white gap between the two groups. The dynamic range of the spectrograms was reduced to 40.0 to eradicate, as much as possible, any representation of background noise. Thus, the portions of silence are more clearly represented by an absence of grey shades. This portion of silence is followed by a friction noise whose outburst is not so distinct because it is a voiceless sound and because it is word final, hence, there is a fading quality to this phoneme. This instance of substitution was common to many of the participants. However, one five-year-old male participant's utterance was used as a representation of the others. Another instance of substitution is presented below, however, this second instance involves voiced dental fricative (/ð/) being substituted with voiced alveolar plosive (/d/).

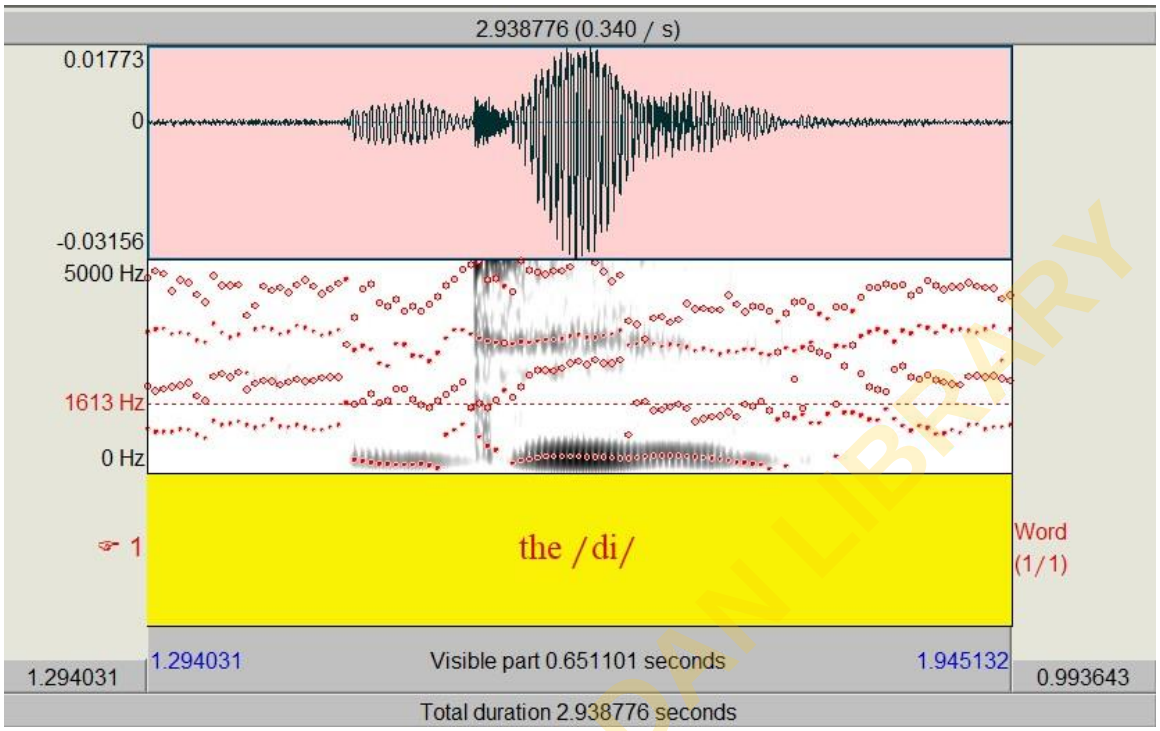


Fig. 4.5 Acoustic illustration of substitution in /di/ "the" by a five-year-old

The centre of analysis in Figure 4.5 is a consonant phoneme, specifically, the substitution of voiced dental fricative /ð/ with voiced alveolar plosive /d/. The presence of the substitute in the acoustic analysis above is represented by the outburst of acoustic energy which extends from 100Hz to about 5000Hz; also, there is a clear display of the outburst as shown by the straight line of spectrogram that the dark shades of grey represent. This shows that the sound produced at that point is both plosive and voiced. This phoneme is closely followed by clearly defined fundamental frequencies, showing that the segment following the voiced plosive is a vowel. This vowel phoneme has a high F_2 value (1613Hz), showing that the articulation is close to the lips, and in this case, the phoneme is /i/.

4.3.3 Constraints ranking for monophthongisation

Four diphthongs were tested for the process of monophthongisation among the participants. The tested diphthongs were /ai/, /ei/, /əu/, and /eə/. *I, vine,* and *time* were used to test /ɑi/*; a, gave, day, play, cake, take, rain, gate, later*, and *away* were used to test /ei/*; home,* and *Rose* were used to test /əu/*;* and, *there, hair* and *where* were used to test /eə/.

4.3.3.1 Realisation of *I*

This first person singular pronoun, *I*, had two variants in the data and these are /ɑi/ (92%) and /ɑ/ (8%). These variants are used as the input for Optimality analysis for the emergence of /ɑi/ in Tableau 4.8.

Tableau 4.8 Emergence of /ɑi/ "I"

I /ɑi/	MAX	NODIPHTHONG
☞a. /ɑi/		*
b. /ɑ/	*!	

Constraints ranking: MAX >> NODIPHTHONG

MAX: No deletion (Every phoneme in the base should have a correspondent in the output) (Wheeler, 2007: p. 3)

NODIPHTHONG: diphthongs are prohibited (Green, 2010: p. 101)

Tableau 4.8 contains two candidates and two constraints. Candidate (b) fatally violates constraint 1 because of the absence of /i/ since the constraint prohibits any deletion of a segment between the base and the output phases. The second violation in the tableau is by the optimal candidate, candidate (a), this violation occurs because candidate (a) remains a diphthong, whereas, diphthongs are prohibited by constraint 2. This violation however, does not prevent the emergence of candidate (a) as the harmonic candidate because the constraint is not as highly ranked as constraint 1. The futility of this violation is indicated by the grey shade of the cells under constraint 2, to show that the violations under this constraint do not prevent the emergence of candidate (a).

4.3.3.2 Realisation of *gave*

Gave is one of the structures used to test the diphthong /ei/ among the participants. This word occurred once in the instrument and there were three variants of it as found in the data. These variants are /**g**ɛv/ (94%), /**g**eiv/ (5%) and /**gɑ**v/ (1%). These variants are considered as the candidates in the input for Optimality analysis that will account for the emergence of /**g**ɛv/ in Tableau 4.9.

Tableau 4.9 Emergence of /gɛv/ "gave"

Gave /geɪv/	NODIPHTHONG	IDENT-IO(VOICE)	MAX
a. /**g**eɪv/	*!		
☞b. /**g**ɛv/			*
c. /**g**ɛf/		*	*

Constraints ranking: NODIPHTHONG >> IDENT-IO$_{(VOICE)}$ >> MAX

NODIPHTHONG: diphthongs are prohibited (Green, 2010: p. 101)

MAX: No deletion (Every phoneme in the base should have a correspondent in the output) (Wheeler, 2007: p. 3)

IDENT-IO$_{(VOICE)}$: Assign one violation mark for every voice feature in the input that is different from its corresponding feature in the output – underlying specifications for voice should be respected (Marc van Oostendorp, 2011: p. 3)

NODIPHTHONG is the higher ranked constraint of the three constraints in this tableau and it has been fatally violated by candidate (a) because of its retention of its closing diphthong /ei/. Candidates (b) and (c) however, prevent a violation of this higher ranked constraint by violating the lesser ranked constraint instead. In other words, rather than retain their closing diphthong /ei/, candidates (b) and (c) delete one of their constituent vowels in order to obey this constraint. The second constraint, IDENT-IO$_{(VOICE)}$, prohibits a change in the voice feature between the input and output phases, the change in the voice feature of voiced labiodental fricative /v/ to voiceless labiodental fricative /f/ in candidate (c) violates this constraint. Therefore, candidate (c) has violated the next highly ranked constraint in the tableau. This violation automatically leads to the emergence of candidate (b) as the harmonic candidate. Its emergence is not deterred by its violation of the third constraint which is the least ranked constraint in the tableau.

4.3.3.3 Realisation of *rose*

Rose is one of the linguistic items used to test the closing diphthong /əu/ among the participants. *Rose* occurred six times in the instrument and there were two variants of the participants' production of it. These variants are /roz/ (96%) and /rəuz/ (4%). These variants are used as the candidates in the input for Optimality analysis that will account for the emergence of /roz/ in Tableau 4.10.

Tableau 4.10 Emergence of /roz/ "rose"

Rose /rəuz/	**NODIPHTHONG**	**MAX**
a. /rəuz/	*!	
☞b. /roz/		*

Constraints ranking: NODIPHTHONG >> MAX

NODIPHTHONG: diphthongs are prohibited (Green, 2010: p. 101)

MAX: No deletion (Every phoneme in the base should have a correspondent in the output) (Wheeler, 2007: p. 3)

Tableau 4.10 has two constraints and two candidates. The first candidate (/rəuz/) violates the first and higher ranked constraint which prohibits the occurrence of a diphthong. This violation is fatal, and since there are only two candidates in the tableau, candidate 2 becomes the likely candidate to emerge as the optimal candidate. This emergence is further made possible because candidate 2 has eliminated its diphthong and replaced it with a pure vowel, thus, violating constraint 2 instead of constraint 1. Constraint 2 is not as highly ranked as constraint 1, so this violation is not fatal. Thus, candidate (b), /roz/, emerges as the optimal candidate.

4.3.3.4 Realisation of *where*

The fourth diphthong that was tested is the centring diphthong /eə/ and *where, there* and *hair* were used to test it. *Where* occurred once in the instrument and the participants produced two variants for this structure. These variants are /we/ (97%) and /weə/ (3%). These variants are subjected to Optimality theoretical analysis in Tableau 4.11.

Tableau 4.11 Emergence of /we/ "where"

Where /weə/	**NODIPHTHONG**	**MAX**
☞a. /we/		*
b. /weə/	*!	

Constraints ranking: NODIPHTHONG >> MAX

NODIPHTHONG: diphthongs are prohibited (Green, 2010: p. 101)

MAX: No deletion (Every phoneme in the base should have a correspondent in the output) (Wheeler, 2007: p. 3)

There are two candidates and two constraints in Tableau 4.11. The first and higher ranked constraint prohibits diphthongs while the second constraint prohibits deletion. To obey the higher ranked constraint, candidate (a) removes one of the vowels in its diphthong, violating constraint 2 rather than constraint 1. Candidate (b) however retains its diphthong and fatally violates constraint 1 as result. Thus, candidate (a) emerges as the optimal candidate.

4.3.3.5 Realisation of *may*

This instance of monophthongisation is culled from the longitudinal section of the data and it involves a reduction of the diphthong /ei/ to /ɛ/. This change is very similar to the ones that were recorded in the cross-sectional data and the same constraints ranking apply to this instance too. The structure has been theoretically analysed in the tableau.

Tableau 4.12 Emergence of /mɛ/ "may"

Where /weə/	NODIPHTHONG	MAX
☞a. /we/		*
b. /weə/	*!	

Constraints ranking: NODIPHTHONG >> MAX

NODIPHTHONG: diphthongs are prohibited (Green, 2010: p. 101)

MAX: No deletion (Every phoneme in the base should have a correspondent in the output) (Wheeler, 2007: p. 3)

There are two candidates and two constraints in Tableau 4.12 above. The first and higher ranked constraint prohibits diphthongs while the second constraint prohibits deletion. To obey the higher ranked constraint, candidate (a) removes one of the vowels in its diphthong, violating constraint 2 rather than constraint 1. Candidate (b) however retains its diphthong and fatally violates constraint 1 as result. Thus, candidate (a) emerges as the harmonic candidate.

4.3.3.6 Representative acoustic analysis of monophthongisation

There are five words that were used to test the process of monophthongisation, four of these linguistic items exhibited the process while one remained as a diphthong. Of these four instances, *rose* has been acoustically illustrated to show monophthongisation.

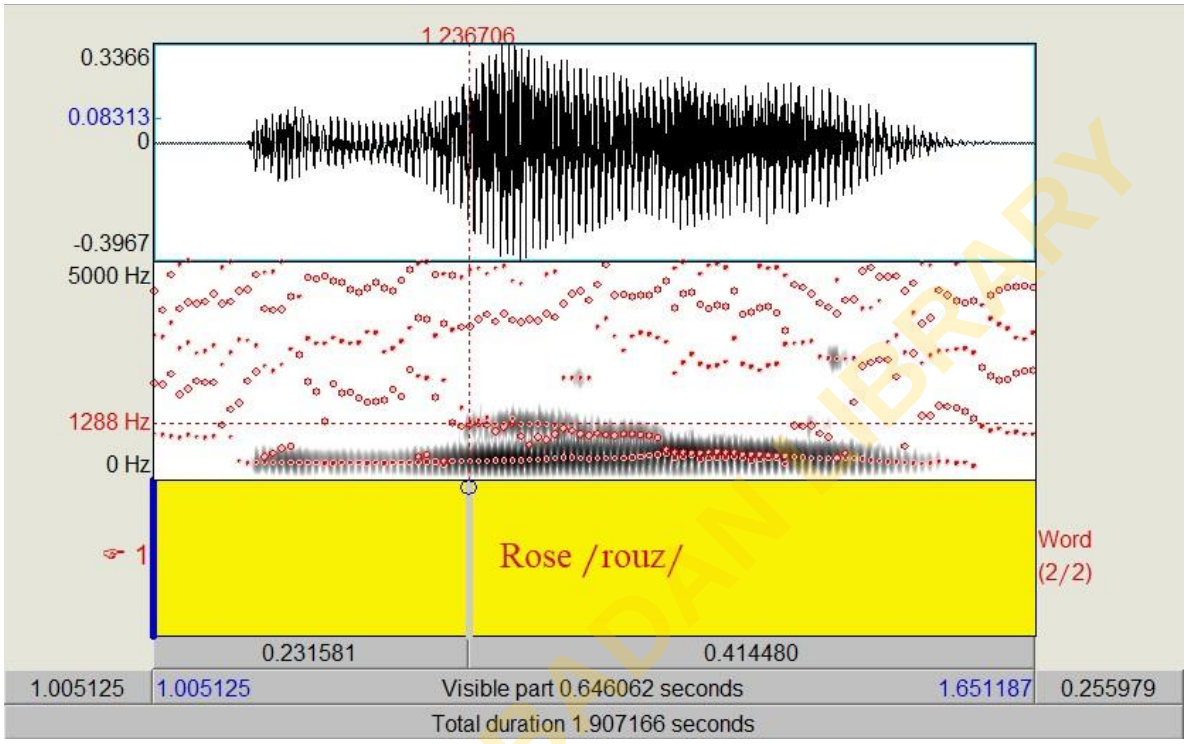


Fig. 4.6 Acoustic analysis of monophthongisation in /roz/ "rose" by a five-year-old

Figure 4.6 above presents the acoustic analysis of *rose.* The first and second formants of the vowels in the word are the most prominent in the spectrogram and this is shown by the red dots that consistently line the central portion of the spectrogram where the peak, which is the vowel segment, is located. A closer observation of these formant dots shows that there is a slight descent in F_2 values from the beginning of the peak to its end. The average values for F_1 and F_2 have been automatically retrieved from PRAAT and plotted on the acoustic vowel chart below. F_1 value is 467.31Hz and F_2 value is 1049.78Hz.

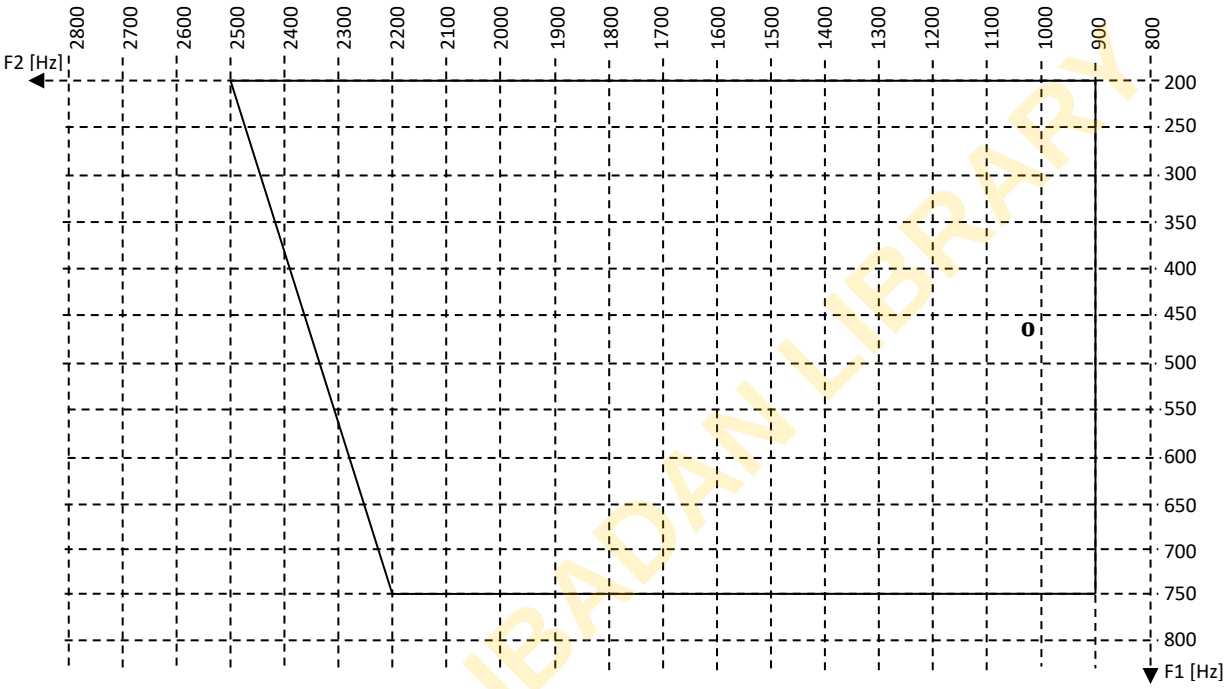


Fig. 4.7 Acoustic vowel chart for /o/ by a five-year-old

The position of this vowel on the acoustic chart above shows that its place of articulation on the tongue is at the back, and the height of the tongue during its articulation is somewhere between half close and half open. This vowel phoneme is much closer to half-close back rounded vowel /u/ in the closing diphthong found in the British English transcription of *rose* /rəʊz/, than it is to half-open central neutral vowel /ə/. The slight descent of the second formant value which was noticed in the spectrogram is an indication that the articulation of this vowel segment is towards /u/, because F_2 values are an indication of articulation distance from the lips, that is, towards the back of the tongue. The F_2 value of this sound begins at 1283.925329Hz and ends at 991.499879Hz, a clear reduction of value. Although only one participant's utterance was used to derive this acoustic representation, the production is very similar to the majority of the participants in the data.

4.3.4 Constraints ranking for Assimilation

Four linguistic structures were used to test the process of assimilation and these are *of blue, like blue, Jane's home* and *like this*. *Of blue* had three variants; *Jane's home* had two variants; *like this* had three variants and *like blue* had three variants in the data. All the instances of assimilation were regressive in direction. *Like blue* is analysed in the tableau below and its variants serve as the candidates in the tableau. Also, two instances of the process of assimilation have been culled from the longitudinal data and analysed theoretically. These structures are *have password* and *give me* from the older and younger participants, respectively.

4.3.4.1 Realisation of *like blue*

Like blue occurred once in the instrument and there were three variants of it which are /l**ɑ**i**g**blu/ (95%), /l**ɑ**ikblu/ (3%) and /l**ɑ**kblu/ (2%). These variants are used as the input for Optimality analysis for the emergence of /l**ɑ**i**g**blu/ in Tableau 4.13.

Tableau 4.13 Emergence of /laigblu/ "Like blue"

like blue /laik blu/	AGREE(voice)	FIN VOI	αF
a. /laikblu/	*!	*	
☞ b. /laigblu/			*
c. /lakblu/	*!	*	*

Constraints ranking: AGREE(voice) >> FIN VOI >> αF

AGREE(voice): Assign a violation mark for every pair of adjacent consonants whose members differ in their specification for voice (Lamont, 2015: p. 54)

FINAL VOICING: Phonemes in syllable coda must be voiced (Lamont, 2015: p. 55)

αF: correspondent segments in input and output must have identical values (Mustafawi, 2006: p. 76)

The tableau has three candidates and three constraints. There are two fatal violations of the most highly ranked constraint by candidates (a) and (c). This constraint prohibits the occurrence of contiguous consonant phonemes if they are different in voice feature, and since candidate (a) has the voiceless alveolar plosive (/k/) occurring beside the voiced bilabial plosive (/b/), it automatically violates this constraint. Candidate (c) commits a violation in the same way too.

The second constraint (FIN VOI) which compels final phonemes to be voiced is violated by candidates (a) and (c) because their first syllables end in voiceless velar plosives (/k/). The second candidate ends in a voiced velar plosive /**g**/ and does not violate this constraint. Constraint 3 requires faithfulness of the features of the output to that of the input, that is, the features in the output should match those of the input. Candidates (b) and (c) violate this constraint because of the changes that have occurred between the input and the output stages. From these violations, candidate (b) emerges as the harmonic candidate because candidates (a) and (c) already incurred fatal violations against constraint 1.

4.3.4.2 Realisation of *have password*

This instantiation of assimilation is also regressive and it affects the feature of voice because voiced labiodental fricative /v/ changes to voiceless /f/ as shown in the tableau. This change is engendered by the segment's occurrence before voiceless bilabial plosive /p/. This assimilation is theoretically analysed in the tableau.

Tableau 4.14 Emergence of /hɑf/ "Have"

Have /hɑv/	σCONT	*SCHWA	MAX	IDENT-IO(voice)
a. /hɑv/	*!			
☞b. /hɑf/				*
c. /əv/		*	*	

Constraints ranking: σCONT >> *SCHWA >> MAX >> IDENT-IO(voice)

σCONT: the onset of a syllable must not be of greater sonority than the last segment (Pons, 2005: p. 13)

***SCHWA:** The realisation of a central vowel is banned (Wheeler, 2007: p. 8)

MAX: No deletion (Every phoneme in the base should have a correspondent in the output) (Wheeler, 2007: p. 3)

IDENT-IO(voice): Every voice feature in the input that is different from its corresponding feature in the output is prohibited – underlying specifications for voice should be respected (Marc van Oostendorp, 2011: p. 3)

MAX and IDENT-IO(voice) are faithfulness constraints and they are more lowly ranked than the markedness constraints in the tableau; this is a major observable feature in the participants' utterances. Thus, this proves that the most important thing is not just articulating towards the target pronunciation of the adult, rather, it is producing utterances as simplified as possible while trying to produce the target language.

The assimilation process in this instance affects voiced labiodental fricative /v/ which occurs before voiceless bilabial plosive /p/, although both occur in two different syllables. During production, the voiceless state of /p/ regressively influences /v/, hence assimilating it into the voiceless form /f/. The emergence of candidate (b) (/hɑf/) as the optimal candidate means that the other candidates have violated at least one of constraints σCONT, *SCHWA or MAX. *SCHWA prohibits the occurrence of a central vowel – this means that candidate (c) has violated this constraint because it contains half-open central neutral vowel /ə/.

MAX requires that the segments in the input are all present in the eventual output – this is not the case with candidate (c) since the glottal fricative /h/ has been deleted already. σCONT mandates that the onset of a syllable should not be of greater sonority than the last segment in it; this constraint is also violated by candidate (a) because /h/ is more sonorant than voiced labiodental fricative /v/. This violation is a fatal one because σCONT is the highest ranked constraint in Tableau 4.14. Also, the violation of *SCHWA by candidate (c) means that candidate (b) emerges as the optimal candidate. Proximity is a very important factor in local assimilation of segments to one another. Hence, although /v/ and /p/ belong

to different morphological units, the pause between them is very infinitesimal, almost non-existent, which prompts the regressive assimilation to occur quite easily and noticeably.

4.3.4.3 Realisation of *give me*

This final instance of assimilation was also regressive and is got from the longitudinal data, particularly from the younger participant who represents the outset of child language acquisition. There were four instances of this mode of assimilation in this section of the data and these are *give me* which is produced as /'mimi/, *packer* as /'kɑkɑ/, *banana* as /nɑ'nɑnɑ/ and *water* as /'tɔtɑ/. *Give me* is theoretically analysed in the tableau below.

Tableau 4.15 Emergence of /mimi/

/gɪv mi:/ (give me)	*DIFF[SON]	MAX
a. /gɪv mi:/	*!	
b. /gɪf mi:/	*!	
c. /gimi/	*!	*
☞d. /mimi/		*

Constraints ranking: *DIFF[SON] >>MAX

*DIFF[SON]: No sonority differences between onset consonants (Pons, 2005: p. 13)

MAX: No deletion (Every phoneme in the base should have a correspondent in the output) (Wheeler, 2007: p. 3)

There are four candidates and two constraints in the tableau above. The first constraint, *DIFF[SON], prohibits a difference in the sonority of syllable onsets, and candidates (a) to (c) have violated this constraint because nasals are much more sonorous than plosives. Thus, the presence of voiced velar plosive /**g**/ in the onset of the first syllable and the bilabial nasal /m/ in the onset of the second syllable in candidates (a) to (c) is equal to the violation of this higher ranked constraint. Therefore, these violations are fatal. Candidate (d) however, has replaced /**g**/ with bilabial nasal /m/, thus preventing a violation and emerging as the harmonic candidate in the tableau.

Although candidates (c) and (d) violate constraint 2, these violations are trivial because MAX is not as highly ranked as the first constraint. Therefore, candidate (d) still emerges as the optimal candidate in the tableau.

This participant was noticed to favour the onsets of monosyllabic words over the codas so that monosyllabic words were articulated without their codas. This assimilation is a regressive one because its influence is backwards in direction. Also, unlike the assimilation process which is known to affect voice, place or manner of articulation, this assimilation forces all of its features on the concerned phoneme; hence, it replaces the sound totally. In other words, two processes simultaneously occur in these instances – assimilation and substitution. The substitution does not happen arbitrarily, rather, a second onset replaces the first.

4.3.4.4 Representative acoustic analysis of assimilation

Four structures in the instrument were used to test the process of assimilation among the participants, and of these four structures, *like blue* /l**ɑ**i**g**blu/ has been acoustically analysed in the figure.

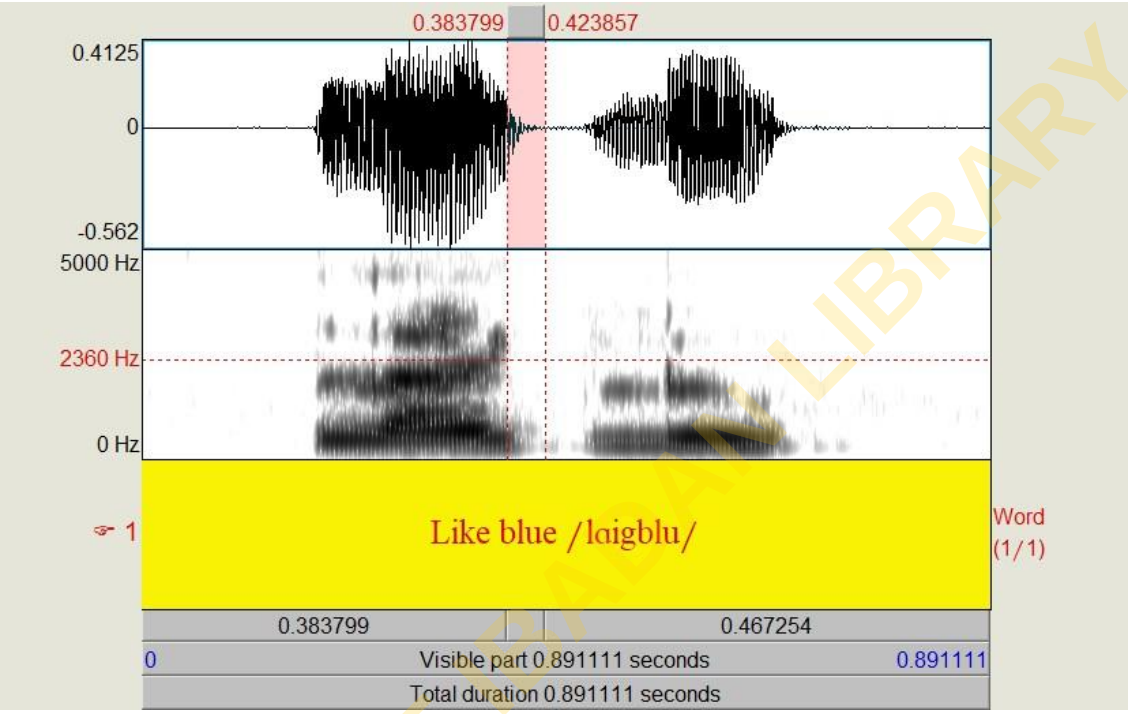


Fig. 4.8 Acoustic illustration of assimilation in /laɪgblu/ by a five-year-old

The particular segment under analysis in the figure above is the coda of the first syllable (voiceless velar plosive /k/) which has been assimilated to voiced velar plosive /**g**/. This segment is very subtly produced and takes only a small fraction (0.04 seconds) of the total milliseconds (0.89 seconds) used to produce the structure. Also, the portion of silence that is customary with plosives is absent from this segment, and the only concentration of acoustic energy that shows that it is a voiced sound is at the base of the fundamental frequency where dark shades are visible. This portion of the syllable is very subtle and even though only one participant's utterance has been used to generate this acoustic analysis, it can be regarded as representative of a majority of the participants.

4.3.5 Constraints ranking for deletion

Nine linguistic structures were used to test the process of deletion and these were *next, set, grandma, grandpa, and, friends, combed, want,* and *textbooks.* Deletion occurred significantly in all the linguistic structures except *friends* where many of the participants maintained the number of the consonant phonemes in the margins. Thus, *textbooks* which had a significant portion of deletion and *friends* which had limited deletion are theoretically analysed in the subsequent tableaux. *Textbooks* and *friends* occurred once each in the instrument and have three and four variants, respectively.

4.3.5.1 Realisation of *Textbooks*

The variants of the production of *textbooks* are /tezbuk/ (68%), /tezbuks/ (15%), /tekstbuks/ (11%), and /teksbuk/ (6%). These variants serve as candidates in the input for Tableau 4.16.

Tableau 4.16 Emergence of /tezbuk/ "textbooks"

Textbooks /tekstbuks/	***COMPLEX**	**MAX**
a. /tekstbuks/	**!!	
b. /teksbuks/	**!!	*
c. /tesbuks/	*!	*
d. /tezbuks/	*!	*
☞e. /tezbuk/		*

Constraints ranking: *COMPLEX >> MAX

***COMPLEX**: a syllable has no more than one consonant in a margin (Wheeler, 2007: p. 3)

MAX: No deletion (Every phoneme in the base should have a correspondent in the output) (Wheeler, 2007: p. 3)

Tableau 4.16 contains five candidates and two constraints. All the violations against constraint 1 are fatal because it is the higher ranked constraint. Candidates (a) and (b) violate this constraint twice each, hence the double asterisks and exclamation marks. This constraint prohibits complex margins, that is, a margin – whether onset or coda, is not permitted to have more than one consonant phoneme. The presence of more than one phoneme in the coda of candidates (c) and (d), and the presence of more than one consonant phoneme in the coda of the first and second syllables of candidates (a) and (b) are violations of this constraint. Only candidate (e) obeys this constraint by getting rid of its excess consonant phonemes. Thus, candidate (e) emerges as the optimal candidate.

This emergence is still valid despite candidate (e)'s violation of the second constraint which prohibits any form of deletion. This is because the second constraint is not as highly ranked as the first which it has obeyed. The second constraint (MAX) is also violated by four other candidates, (b) to (e), since some segments have been deleted.

Because the violations under constraint 1 have already produced an optimal candidate, the rest of the tableau is shaded in grey colour, showing the limited relevance of whatever happens there to the emergence of /tezbuk/.

4.3.5.2 Realisation of *Friends*

The variants of the enunciation of *friends* were /frendz/ (58%), /frens/ (29%), and /frend/ (13%). These variants serve as candidates in the input for Tableau 4.17.

Tableau 4.17 Emergence of /frend/

Friends /frendz/	**MAX**	***COMPLEX**
a. /frend/	*!	**
☞b. /frendz/		**
c. /frens/	*!	**

Constraints ranking: *COMPLEX>> MAX

***COMPLEX:** a syllable has no more than one consonant in a margin (Wheeler, 2007: p. 3)

MAX: No deletion (Every phoneme in the base should have a correspondent in the output) (Wheeler, 2007: p. 3)

There are three candidates and two constraints in Tableau 4.17. The higher ranked constraint (MAX) prohibits the deletion of any phoneme, but only candidate (b) obeys this constraint, while candidates (a) and (c) violate it through a deletion of voiced alveolar fricative /z/ and voiced alveolar plosive /d/, respectively. Thus, the majority of the participants retained the consonant clusters in this linguistic structure, unlike *textbooks* which was analysed in the previous tableau. The motivation for this variation is difficult to decipher because both structures are made up of almost the same types of phonemes.

4.3.5.3 Realisation of *want*

This instance of deletion is derived from the longitudinal data, from the older participant specifically. This structure is analysed in the next tableau.

Tableau 4.18 Emergence of /wɔn/ want

Want /wɔnt/	***COMPLEX**	**MAX**
a. /wɔnt/	*!	
☞b. /wɔn/		*

Constraints ranking: *COMPLEX >> MAX

MAX: No deletion (Every phoneme in the base should have a correspondent in the output) (Wheeler, 2007: p. 3)

***COMPLEX:** a syllable has no more than one consonant in a margin (Wheeler, 2007: p. 3)

The structure analysed in Tableau 4.18 is taken from a string of utterances and the features of context have inadvertently engendered the phonological process of deletion in the analysed lexical structure. This structure /wɔnt/ ends in the voiceless alveolar plosive (/t/), this is the phoneme which also began the next word in the data. Thus, this presents an instance of juncture prosody in continuous speech which leads to the elision of the first voiceless alveolar plosive. As a result of this, the deletion of /t/ is encouraged, especially, when it has occurred in-between two consonant phonemes, the second of which is also a voiceless alveolar plosive /t/.

Considering the first constraint in the tableau above, the retention of a complex coda in the first candidate leads to a fatal violation of the higher ranked constraint, leaving the second candidate to emerge as the optimal candidate. The activities under this constraint are enough to determine which of the two candidates is harmonic; thus, the other row in the tableau is shaded grey to show that the activities in them do not affect the overall emergence of the already decided harmonic candidate under constraint 1.

The second and lower ranked constraint (MAX) in the tableau is violated by candidate (b) but this does not engender any change because it is not as highly ranked as the first. Also, candidate (b)'s obedience of constraint 1, the higher ranked constraint, already leads to its emergence as the harmonic candidate.

4.3.5.4 Realisation of *come*

This is another instance of deletion as found in the longitudinal data, however, this is retrieved from the younger participant's data at the outset of the longitudinal data collection at one year, three months. This participant constantly elided the final consonants of monosyllabic words so that words like *come, take, phone, food, ball* and *fine* were enunciated as /kɔ:, tɛ, fo, fu, bɔ:, fa/, respectively. "Come" /ko/ has been analysed below.

Tableau 4.19 Emergence of /kɔ/ *come*

Come /kʌm/	***C]$_{\sigma}$**	**MAX**
☞ a. kɔ:		*
b. kɔm	*!	
c. kʌm	*!	

Constraints ranking: *C]$_{\sigma}$ >> MAX

*C]$_{\sigma}$ - Syllables must not have codas. (Borowsky, 1989: p. 146)

MAX: No deletion (Every phoneme in the base should have a correspondent in the output) (Wheeler, 2007: p. 3)

The first constraint, *C]$_{\sigma}$, is a markedness constraint which prohibits syllables from having codas. This constraint ranks higher than MAX and its violation by candidates (b) and (c) leads to the emergence of candidate (a) as the optimal candidate. Since *C]$_{\sigma}$ ranks higher than MAX, candidate (a)'s violation of MAX is not relevant because EVAL has determined the harmonic candidate. Hence, the second column of the constraints is shaded grey because no matter the violations that occur there, the emergence of the optimal candidate (/kɔ/) is not affected.

With the deletion of the final consonant in the analysed word, the phonological grammar of this participant elevates the markedness constraint above the faithfulness constraint because the eventual output /kɔ/ is not identical with the input of /kʌm/, a requirement that ranks highly in faithfulness constraints. For a child at the outset of the use of the expressive language skill, this production is similar to that of the target production and intelligibility is still achieved. It is noted though, that whenever the participant used this word, it was accompanied with a physical gesture of the hand which must have been imitated from adults around. This gives more credence to the contribution of imitation in a child's language acquisition process than the literature accords it. This participant began to produce this word at age 1;7 and continued to use it beyond this time. Comprehension of this word already manifested before this time.

4.3.5.5 Representative acoustic illustration of deletion

Nine linguistic structures were used to test the process of deletion as realised among the participants. Of the nine structures, *second* /sekɔn/ has been acoustically analysed in the figure below.

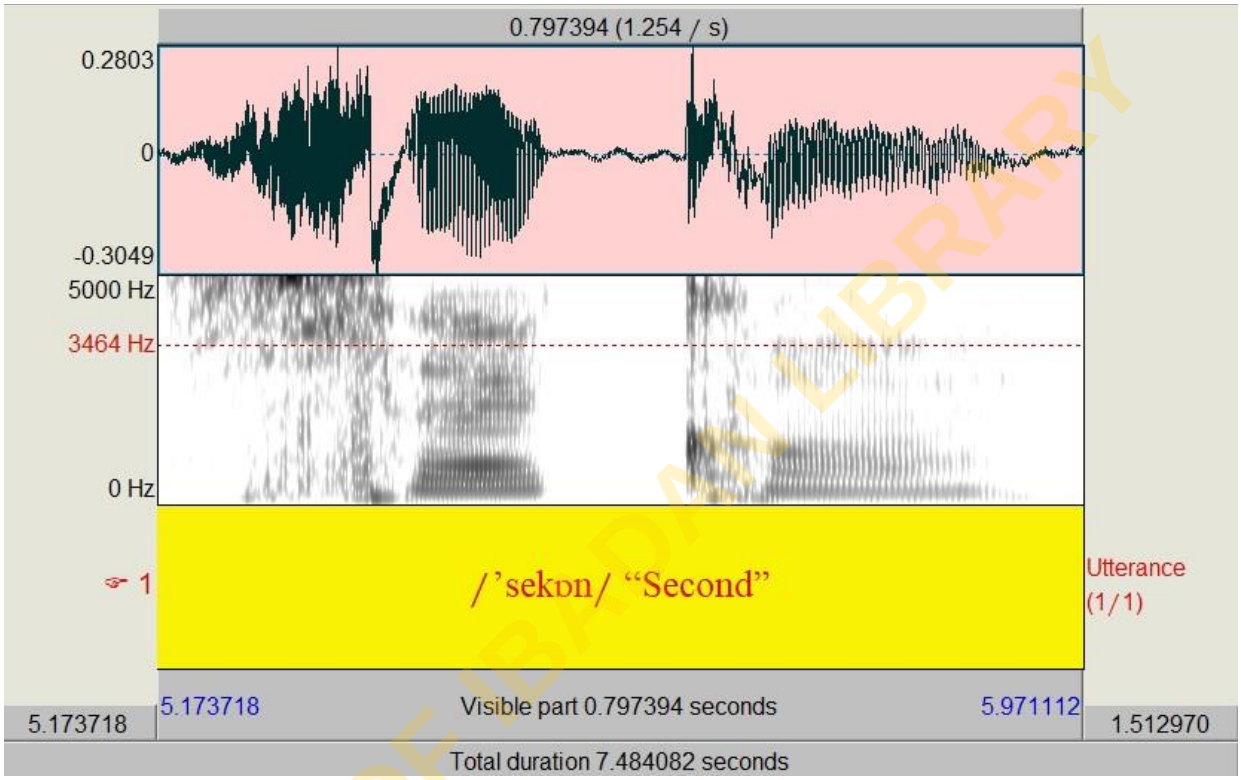


Fig. 4.9 Acoustic analysis of deletion in "second" /'sekɔn/ by a four-year-old

The coda in the second syllable of this structure has been deleted. Meanwhile, the phonemes that are left can be identified by the spectrogram represented by the different shades of grey, and these begin from about 5.57seconds on the spectrogram. This portion of the analysis begins with a burst of acoustic energy which is representative of a plosive. This plosive is not a voiced one and this is evident by the absence of fundamental frequency which shows the inactivity of the vocal cords. This wave is followed by clear formants that are indicative of a vowel segment. Vowels are always voiced and the indication for the voiced state, the fundamental frequency, extends into the last parts of the spectrogram. This shows that a new sound ends this structure and this sound has the similitude of a vowel but is not a vowel, as the other formants are absent. In other words, there is an indication of a nasal and nothing more – the plosive which ought to have ended the structure is absent from the spectrogram which means that it has been elided.

4.3.6 Constraints ranking for vowel strengthening

The central vowels /ʌ ɜ: ə/ were tested for the process of vowel strengthening among the participants. Twelve words which contained these vowel phonemes were inserted into the instrument. These words are *sun, water, bud, cut, up, mum, us, our, month, little, away* and *birthday.* Vowel strengthening occurred significantly in all the linguistic structures. Five of these words have been purposively selected for theoretical analysis in the subsequent tableaux. Each central vowel is represented, and the other two words have peculiar structures which have prompted their representation in the tableaux.

4.3.6.1 Realisation of *Cut*

Cut was used to test vowel strengthening in open central neutral vowel /ʌ/. There were two variants during the participants' pronunciation of *cut*, and these are /kɔ:t/ (97%) and /kʌt/ (3%). These variants are presented as candidates in the Optimality analysis in Tableau 4.20.

Tableau 4.20 Emergence of /kɔt/ "cut"

Cut /kʌt/	***SCHWA**	**αF**
a. /kʌt/	*!	
☞b. /kɔ:t/		*

Constraints ranking: *SCHWA >> αF

***SCHWA:** The realisation of a central vowel is banned (Wheeler, 2007: p. 8)

αF: correspondent segments in input and output have identical values for [voice], [high] and [cont] (Mustafawi, 2006: p. 76)

There are two constraints and two candidates in the tableau above. *SCHWA is the higher ranked constraint and it forbids the realisation of a central vowel. This constraint ranks higher than the second constraint, αF, which is a faithfulness constraint and which encourages input and output segments to have identical values for each feature.

Candidate (a) violates *SCHWA because its peak is a central vowel. Candidate (b) however, obeys this constraint because its peak is not a central vowel, but a back vowel. By changing its peak from central to back vowel, candidate (b) violates the second constraint which mandates that corresponding segments in input and output should have identical values. Candidate (b)'s violation of this second constraint makes it to emerge as the optimal candidate because constraint 2 is not as highly ranked as constraint 1.

The rest of the words that contain open central neutral vowel /ʌ/ and were used to test vowel strengthening underwent this process of vowel strengthening too so that *sun, bud, up, mum, us*, and *month* were produced as /sɔ:n/, /bɔ:d/, /ɔ:p/, /mɔ:m/, /ɔ:s/ and /mɔ:nt/, respectively. Like half-open central neutral vowel /ə/, /ʌ/ is also a subtle sound and enjoys a peculiar pronunciation by Nigerian speakers of English. This sound is absent from many Nigerian languages which have much fewer vowel phonemes than the English language. Naturally therefore, speakers unconsciously replace these phonemes with similar ones which are present in Nigerian languages. Thus, the constraint *SCHWA, a markedness constraint that forbids the subtle central vowels, is ranked higher than the faithfulness constraint which forbids any changes to be made to the features in the input.

4.3.6.2 Realisation of *Our*

The triphthong, *our,* was used to test half-open central neutral vowel /ə/ and it occurred five times in the instrument. There were two variants for this word which are /ɑwɑ/ (80%) and /ɑuə/ (20%). /ə/ was tested in this word and also analysed in Tableau 4.21.

Tableau 4.21 Emergence of /ɑwɑ/ "our"

Our /ɑʊə/	***COMPLEX^{VOW}**	***SCHWA**	**αF**
a. ɑʊə	*!	*	
☞ b. ɑwɑ			*
c. ɑwə		*	*

Constraints ranking: *COMPLEX^{VOW} >> *SCHWA >> αF

*COMPLEX^{VOW}: No string of vowels within a syllable (Green, 2010: p. 101)

*SCHWA: The realisation of a central vowel is banned (Wheeler, 2007: p. 8)

αF: correspondent segments in input and output must have identical values (Mustafawi, 2006: p. 76)

There are three candidates and three constraints in the previous tableau. The input itself is a triphthong, hence, it has no consonant phoneme at all. Of the three generated candidates, only one retains the half-close back rounded vowel /u/ while the other two have the fully glided version of /u/ which is the bilabial semivowel /w/ in them. The first constraint prohibits the occurrence of triphthongs within a syllable; hence, candidate (a) violates this constraint by retaining its triphthong. Candidates (b) and (c) however have obeyed this constraint by converting /ʊ/ to /w/. This constraint (*COMPLEX^{VOW}) is the highest ranked in the tableau, so its violation by candidate (a) is fatal. As for the second constraint, *SCHWA, it prohibits the presence of a central vowel in a syllable and its realisation in candidates (a) and (c) show a violation which leads to the emergence of candidate (b) as the harmonic candidate. Although candidate (b) also violates the third constraint, αF, which mandates that correspondent segments in input and output must have identical values, its emergence as the optimal candidate still stands.

4.3.6.3 Realisation of *Away*

This disyllabic word *away* was also used to test vowel strengthening and it occurred twice in the instrument. It has been purposively selected for theoretical analysis because it has schwa as the only phoneme in the first syllable. There were three variants and they are /ɑwei/ (95.5%), /ɑwɛ/ 3.5% and /əwei/ 2%. Half-open central neutral vowel /ə/ is the central vowel that was tested for this process. Tableau 4.22 presents the analysis for this emergence.

Tableau 4.22: Emergence of /ɑwɛ/ "away"

Away /əwei/	***SCHWA**	**NODIPHTHONG**	**αF**
a. /**ɑ**wei/		*	*
☞b. /**ɑ**wɛ/			*
c. /əwei/	*!	*	

Constraints ranking: *SCHWA >> NODIPHTHONG >> αF

*SCHWA: The realisation of a central vowel is banned (Wheeler, 2007: p. 8)

NODIPHTHONG: Diphthongs are prohibited (Green, 2010: p. 101)

αF: Correspondent segments in input and output have identical values for [voice], [high] and [cont]. (Mustafawi, 2006: p. 76)

The three variants from the data are the candidates in Tableau 4.22, and there are three constraints as well. The first and most highly ranked constraint (*SCHWA) prohibits the realisation of any central vowel, so the presence of half-open central neutral vowel /ə/ in candidate (c) engenders a fatal violation as indicated by the asterisk and the exclamation mark. The second constraint also prohibits the presence of a diphthong and candidates (a) and (c) violate this constraint. The final constraint in the tableau prohibits any form of change in the values of a segment from the input to the output phase. Candidates (a) and (b) violate this faithfulness constraint. Despite this violation however, candidate (b) still emerges as the optimal candidate because of the violations that have been incurred against constraints 1 and 2 by the other candidates. This is responsible for the shaded cells under constraint 3, because regardless of the violations that all the candidates incur, candidate (b) will still emerge as the harmonic candidate.

4.3.6.4 Realisation of *birthday*

Birthday occurred three times in the instrument, and has in fact been used to test the process of substitution. However, this word also contains half-close central neutral vowel /ɜ:/, so it was also used to test the process of vowel strengthening. There were four variants of the participants' production and these are /bedɛ/ (86%), /bɜ:θdɜ/ (6.7%), /betdɛ/ (6.3%) and /bɜ:θdei/ (1%). The variants are the candidates in Tableau 4.23 below. However, it is necessary to reformulate these frequencies since vowel strengthening is what is being considered here, and this occurred in more than one variant which are /bedɛ/ (86%) and /betdɛ/ (6.3%); thus, it can be logically concluded that vowel strengthening occurred in 92.3% of the total of variants. For the sake of the analysis in the tableau, the four variants are inserted as candidates.

Tableau 4.23: Emergence of /bedɛ/ "birthday"

Birthday /bɜ:θdei/	*SCHWA	NODIPHTHONG	*FRICATIVE	αF
☞a. /bedɛ/				*
b. /bɜ:θdɛ/	*!		*	*
c. /betdɛ/	*!			*
d. /bɜ:θdei/	*!	*	*	

Constraints ranking: *SCHWA >> NODIPHTHONG >> *FRICATIVE >> αF

*SCHWA: The realisation of a central vowel is banned (Wheeler, 2007: p. 8)

NODIPHTHONG: diphthongs are prohibited

*FRICATIVE: Segments may not be [+cont, –son] (Pater and Barlow, 2003: p. 492)

αF: Correspondent segments in input and output have identical values for [voice], [high] and [cont] (Mustafawi, 2006: p. 76)

There are four constraints in the tableau as well as four candidates. The first constraint prohibits central vowels and this constraint is violated by candidates (b) to (d) because of their retention of half-close central neutral vowel (/ɜː/). Candidate (a) however replaces this central vowel with a half-open front spread vowel /e/, thus, avoiding the violation of the most highly ranked constraint. This way, candidate (a) emerges as the optimal candidate. However, there are more violations in the tableau. Constraint 2, NODIPHTHONG, prohibits the occurrence of a diphthong and this is violated by candidate (d) which still retains its diphthong. The third constraint is *FRICATIVE and it prohibits the occurrence of fricatives in a structure. This constraint is also violated by candidates (b) and (d) because of the presence of voiceless dental fricative (/θ/) in the codas of their first syllables.

The final constraint is αF and it prohibits any change in feature or value between the input and the output phases. Candidates (a) to (c) violate this constraint. This violation is the only one incurred by candidate (a) and it emerges as the optimal candidate in this tableau.

4.3.6.6 Realisation of *another*

Another is culled from the longitudinal data and it contains two different central vowels – open central neutral vowel /ʌ/ and half-open central neutral vowel /ə/ which occurs twice. These vowel phonemes have been strengthened. This instance of vowel strengthening occurred in the older participant's utterance. Other instances of words from her that contain this process are *come, again, sister, around* and *open. Another* has been analysed in the next tableau.

Tableau 4.24 Emergence of /ɑnɔdɑ/ "another"

Another /ənʌðəʳ/	***SCHWA**	**αF**	***F-ONS**
☞a. /ɑnɔdɑ/		*	
b. /ənʌðəʳ/	***!		*

Constraints ranking: *SCHWA >> αF, *F-ONS

*SCHWA: The realisation of a central vowel is banned (Wheeler, 2007: p. 8)

αF: correspondent segments in input and output must have identical values (Mustafawi, 2006: p. 76)

*F-ONS: A fricative cannot occupy the onset position (Pater and Barlow, 2003: p. 496)

This instance of vowel strengthening was chosen for theoretical analysis because it contains two of the three central vowels, one of which appears twice. Thus, the tableau is unlike the previous tableaux already engaged in this section. The uniqueness of this tableau lies in the fatal violations that occur under the first and highest ranked constraint by candidate (b). This fatal violation occurs on three levels since there are three central vowels in the candidate. The highly ranked constraint prohibits the occurrence of a central vowel, thus, violation is multiple.

The other two constraints occupy the same level of hierarchy and the first, αF, prohibits any change between output and input. The other constraint, *F-ONS, prohibits a fricative from occupying an onset position. Both candidates violate either of these constraints. However, the emergence of an optimal candidate is quite clear because of the multiple violations that candidate (b) has incurred against *SCHWA, the highest ranked constraint. Candidate (a) on the other hand, substitutes all three central vowels with non-central and stronger ones, thus, emerging as the optimal candidate.

4.3.6.7 Representative acoustic analysis of vowel strengthening

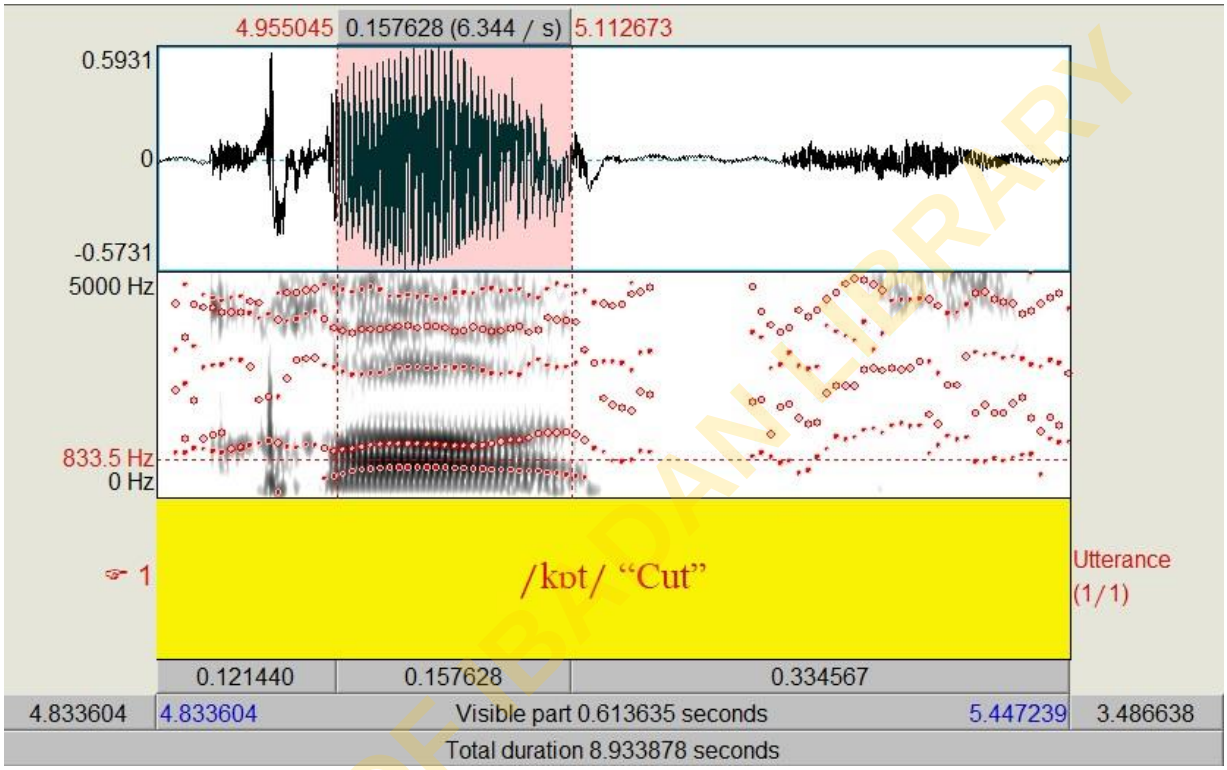


Fig. 4.10 Acoustic analysis of vowel strengthening in "Cut" /kɔ:t/ by a four-year-old

The replacement of the open central neutral vowel /ʌ/ with open back rounded vowel /ɔ:/ occurred frequently in the data and one of these instances has been examined acoustically. In the PRAAT analysis, the vowel portion of the utterance has been selected to capture the formants and the average first and second formant values were extracted. These were found to be 603.98Hz and 1202.08Hz for F_1 and F_2, respectively. These values were plotted on the acoustic vowel chart below and the phoneme was found to occupy the half-open back position.

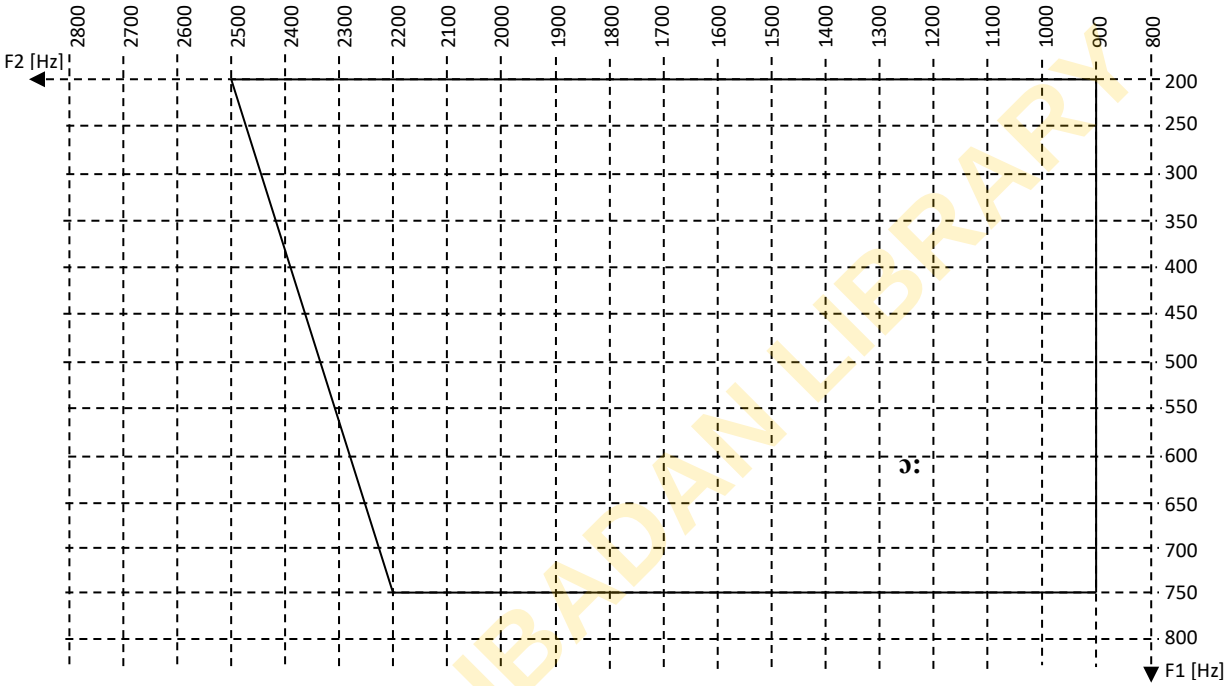


Fig. 4.11 Acoustic vowel chart of vowel strengthening in /kɔːt/ *cut*

The figure above shows the position of the peak in *cut* as produced by the majority of the participants (97%). Although this vowel is plotted based on data got from the vocal tract resonances, its position is very similar to the articulatory chart which is based on the greatest point of tongue constriction only. Plotted using the first and second formant values, this segment /ɔ:/ fits the description of an open back vowel. Back and front vowels are acoustically stronger than central vowels, thus, the central vowel which occupied the peak of this structure has been strengthened and relocated to the back on the acoustic vowel chart.

4.3.7 Gliding

The process of gliding involved the two semivowels /j/ and /w/. It occurred in the word *our* which occurred five times in the instrument and in *I am, I ate* and *I have* which occurred once each in the instrument also. In the case of *our*, there were two variants of the articulation by the participants and these are /ɑwɑ/ and /ɑuə/ with 80% and 20% occurrence, respectively. Thus, there is an 80% occurrence of gliding from /u/ to /w/ in this linguistic structure. This instance of gliding is theoretically analysed in the tableau below, and the variants constitute the candidates in the tableau also.

Tableau 4.25 Emergence of /ɑwɑ/

Our /ɑʊə/	***COMPLEX^{VOW}**	**αF**
a. /aʊə/	*!	
☞ b. /**ɑwɑ/**		*

Constraints ranking: *COMPLEX^{VOW} >> * αF

COMPLEX^{VOW}: No string of vowels within a syllable (Green, 2010: p. 101)

αF: Correspondent segments in input and output have identical values for [voice], [high] and [cont]. (Mustafawi, 2006: p. 76)

There are two candidates and two constraints in the tableau. The input itself is a triphthong, hence, it has no consonant phoneme at all. Of the two generated candidates, one does not contain a consonant phoneme while the other contains a bilabial semivowel /w/. The first constraint prohibits the occurrence of triphthongs, hence, candidate (a) violates this constraint by retaining its triphthong. Candidate (b) adapts itself to obey this constraint by converting /ʊ/ to bilabial semivowel /w/. The first constraint, *COMPLEX^{VOW}, is more highly ranked, so candidate (a)'s violation of it is fatal. As for the second constraint, it prohibits a difference in the values of an output from what obtained in the input. Thus, candidate (b)'s changes have violated constraint 2 which is not as highly ranked as constraint 1. Therefore, candidate (b) emerges as the harmonic candidate.

This instance of gliding was also found in the longitudinal data collected from the older participant. The commonness of this instance to both groups, as well as the high rate of occurrence in the cross-sectional data confirms that complex vowels, especially triphthongs, are sources of pronunciation hiccups for many second language speakers of English in Nigeria.

4.4 Processes exclusive to the longitudinal data

4.4.1 Epenthesis

Epenthesis occurred in the older participant's speech in the longitudinal data and this involved an insertion of a close front spread vowel (/i/) between two contiguously occurring voiced alveolar fricatives /z/. But for the intervention of this epenthetic vowel sound, the only process that would have occurred in this utterance would have been a regressive assimilation of voice from /s/ to /z/ which would then lead to a gemination of /z/. This particular instance of epenthesis is analysed in the tableau below. Apart from this instance however, there is also epenthesis in this participant's articulation of *it*, which was produced as /i'to/.

4.4.1.1 Epenthesis in “Press zero”

Tableau 4.26 Emergence of /preziziro/

Press zero /preziziro/	***SS**	**AGREE (VOICE)**	**O-CONTIGUITY**
a. /prez ziro/	*!		
☞ b. /preziziro/			*
c. /pres ziro/	*!	*	

Constraints ranking: *SS >> AGREE(VOICE) >> O-CONTIGUITY

*SS: Two sibilants are prohibited from occurring adjacently (Borowsky, 1989: p. 148)

AGREE$_{(VOICE)}$: Assign one violation mark for every pair of adjacent consonants whose members differ in their specification for voice (Lamont, 2015: p. 54).

O-CONTIGUITY: this constraint prohibits inserting any epenthetic phoneme between elements standing in correspondence so that there is no disruption in the adjacency relationship in the output (Green, 2010: p. 103)

Tableau 4.26 presents an analysis of epenthesis involving the insertion of close front spread vowel /i/ between two adjacently occurring alveolar fricatives /s/ and /z/. There are three candidates in the first row to be evaluated by EVAL. The first and most highly ranked constraint (*SS) prohibits the occurrence of two sibilants adjacently and this is what is found in candidates (a) and (c), so the occurrence of /zz/ and /sz/ in these candidates means that they have violated this constraint. This violation is a fatal one and leads to the emergence of candidate (b) as the harmonic candidate.

The second constraint, AGREE$_{(VOICE)}$, prohibits a difference in the specification for voice of a pair of adjacent phonemes. Candidate (b) has two alveolar fricatives occurring together, however, both differ in their specification for voice. That is, while the first sound is voiceless, the second is voiced and this is prohibited by constraint 2. Hence, constraint 2 has been violated by candidate (c) although this violation is not a fatal one. The final violation in the tableau is also by candidate (c), the optimal candidate. However, this violation is far from being fatal because the rank of the constraint is the lowest in the tableau, so its violation does not have a major impact on the emergence of the output as the harmonic candidate. The constraint violated is O-CONTIGUITY and it prohibits the insertion of an epenthetic phoneme between adjacent elements. This constraint is anti-epenthesis; however, its potential is greatly restricted because it does not occupy a high rank in the tableau.

In adult speech, it is not impossible to produce two sibilants together, however, in the utterance of the older participant, simplification is the most important underlying factor, hence contiguously occurring sibilants is not the first choice.

4.4.1.2 Representative acoustic analysis of epenthesis

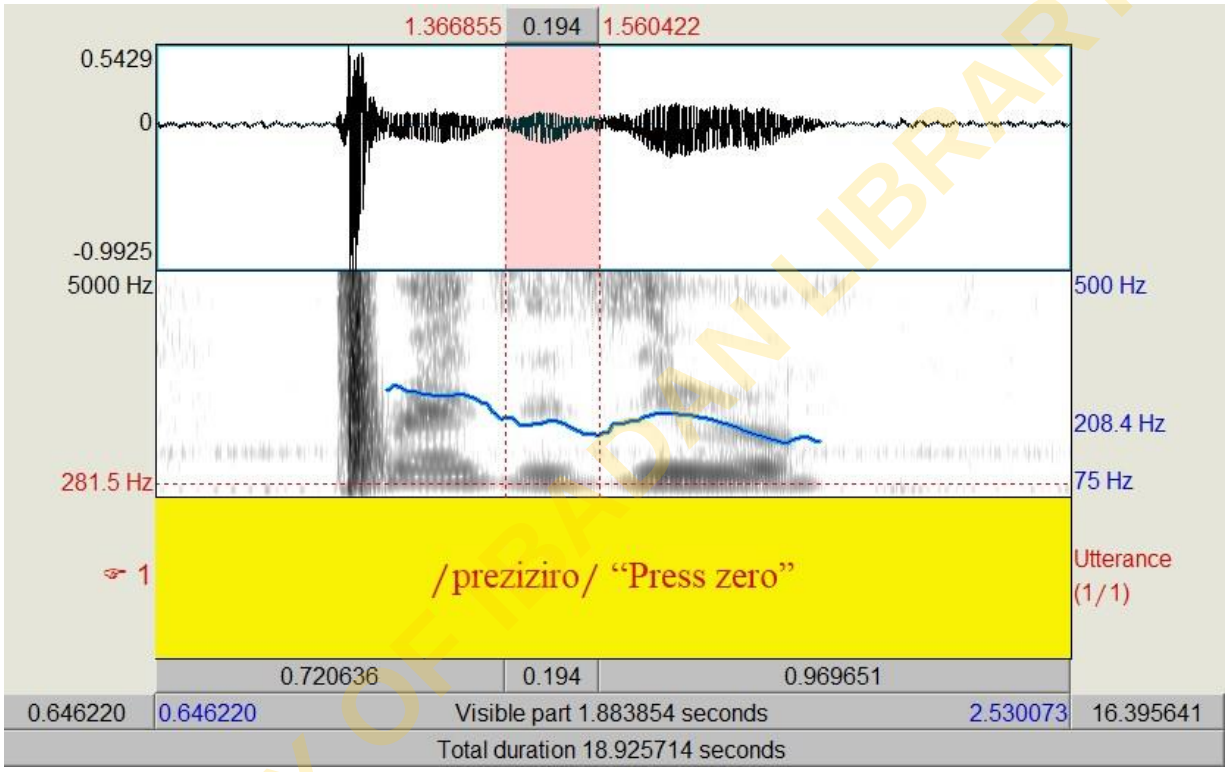


Fig. 4.12 Acoustic analysis of epenthesis in /preziziro/ by a four-year-old

As a result of the epenthesis in the structure above, there are four peaks and are indicated by the upward arcs in the blue line that represents pitch in the acoustic analysis. The highlighted portion is the second peak and represents the epenthesised vowel in the structure. The formants are also clearly visible to authenticate that the area indeed represents the production of a vowel.

4.4.2 Devoicing

Certain segments within some linguistic structures were relieved of their voice feature even though they were produced in isolation of an influencing context or environment. These instances are classified under devoicing and were produced mainly by the younger participant in the longitudinal data. The instances of devoicing found in the data affect "dog" and "bag" (/dɔg, bæg/) which were produced as /dɔ:k, bɑk/, respectively.

Tableau 4.27 Emergence of /dɔk/

Dog /dɔg/	FIN DEV	*VOICEDOBS]$_{\sigma}$	IDENT(voice)	αF
a. dɔg	*!	*!		
☞ b. dɔk			*	*

Constraints ranking: FIN DEV, *VOICEDOBS]$_{\sigma}$ >> IDENT(voice) >> αF

FINAL VOICING: Phonemes in syllable coda must be voiced (Lamont, 2015: p. 55)

*VOICEDOBS]$_{\sigma}$: Coda obstruents are devoiced (Mustafawi, 2006: p. 72)

IDENT(voice): Voice feature remains the same in input and output (Oostendorp, 2011: p. 3)

αF: This constraint compels correspondent segments in input and output to have identical values for [voice], [high] and [cont] (Mustafawi, 2006: p. 76).

There are two candidates and four constraints in Tableau 4.27. The first two constraints jointly rank higher than the other two constraints. This is why the domination symbol (>>) does not appear between FIN DEV and *VOICEDOBS]$_{\sigma}$. The double lines in the tableau between the third and the fourth rows are also an indication of this demarcation between the constraints, while the dotted lines between constraints 1 and 2 show that they occupy the same rank. The first two constraints are responsible for the devoicing of voiced velar plosive /**g**/ to voiceless velar plosive /k/ in "dog". The consonant in the coda of the input is /**g**/, and candidate (b)'s obedience of the first two constraints means that the sound loses its voice feature by the time it emerges as an optimal output. Hence, /dɔ:**g**/ becomes /dɔ:k/ after obeying the constraints. Voice is the only feature that changed, while the manner and place of articulation of the segment remained the same. The other two constraints are not as highly ranked as the first two; hence, candidate 2's violation of these constraints does not change its emergence as the harmonic candidate. The highest ranking constraints in the tableau are markedness constraints, ranking higher than the faithfulness constraints.

This devoiced state of the coda in /dɔ:k/ is another attempt from the participant at simplifying segments. Beyond this explanation however, it is deduced from the data that there is a particular phonological context that prompts this devoicing. This context involves the appearance of a voiced consonant phoneme as the final phoneme in the coda of a syllable. This theory is proposed because the participant was able to produce voiced consonant phonemes when they appeared at the beginning of syllables and words where the phonological contexts are quite different from the consonants that have been devoiced. Participant produced "dog" /dɔ:k/ at nineteen months and "bag" /b**ɑ**k/ at twenty-one months old.

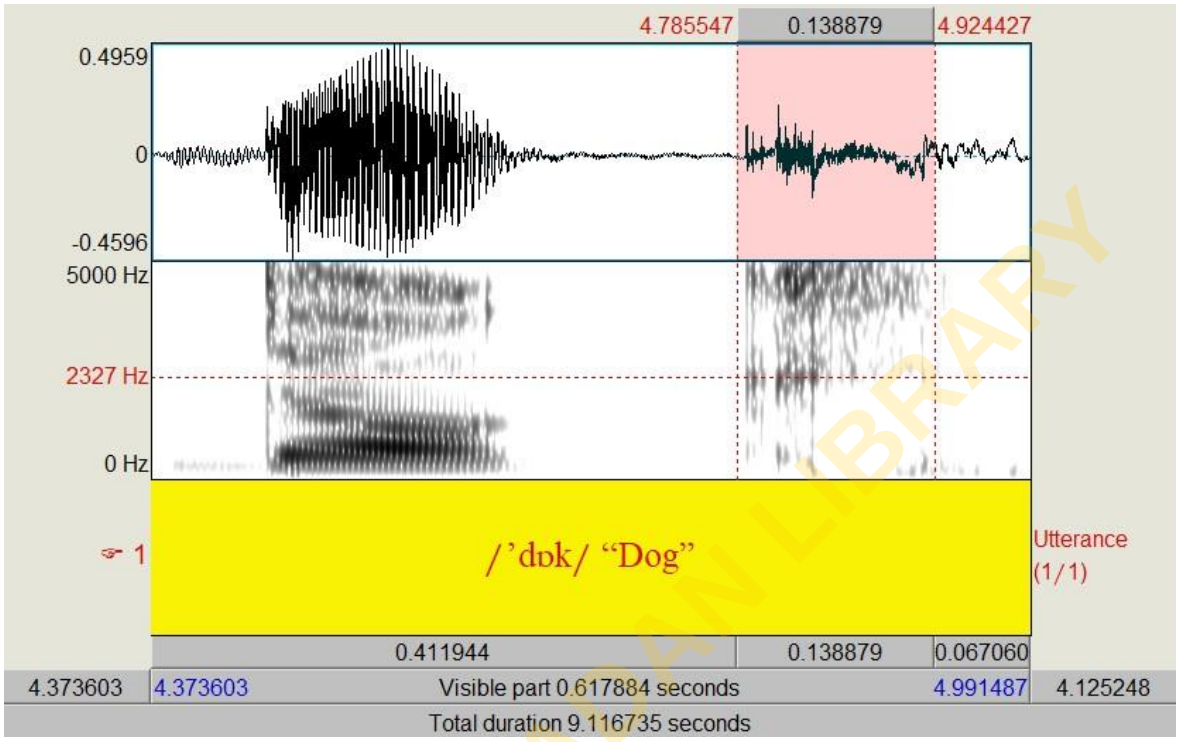


Fig. 4.13 Acoustic analysis of devoicing in "dog" /dɔ:k/ by a one-year-old

The final consonant in this structure has been devoiced and this is shown in the lack of a fundamental frequency (F_0) in the highlighted portion of the spectrogram where the final segment is displayed. There is evidence that this sound is plosive because of the portion of silence that precedes it as well as the burst of energy shown in the upper half of the window. However, the lack of grey shades at the base of this analysis area shows that there was no glottal activity to make the sound voiced.

4.4.3. Stopping

There are several instances of this in the younger participant's utterances and these all involve the voiceless alveolar fricative /s/ being replaced by the voiceless alveolar plosive /t/. These occurrences occur in *sit down* and *sit up*, *see (bag)*, and *see (biscuit)* /ti, ti, ti/.

Tableau 4.28 Emergence of /ti/ "Sit"

Sit /sɪt/	*F-ONS	AGREE(place)
a. sɪt	*!	
b. sɪ	*!	
☞ c. tɪ		*

Constraints ranking: *F-ONS >> AGREE(place)

*F-ONS: A fricative cannot occupy the onset position (Pater and Barlow, 2003: p. 496)

AGREE(place): input and output must have identical place features (Lamont, 2015: p. 54)

To account for the emergence of /ti/ as the optimal candidate in Tableau 4.28, *F-ONS is ranked higher and it prohibits a fricative from existing in an onset position. It is a markedness constraint. It prohibits the use of a fricative as an onset consonant. This gives other consonant sounds, not just the voiceless alveolar plosive /t/ the opportunity to occupy the onset position.

Therefore, candidates (a) and (b) violate constraint 1 which is the higher ranked constraint in the tableau, leading to the emergence of candidate (c) as the optimal candidate. Although candidate (c) violates constraint 2, this violation is no longer relevant because /ti/ already emerged as the optimal candidate.

It is important to note that all of the instances where voiceless alveolar fricative /s/ occurs, the participant replaced them with voiceless alveolar plosive /t/; however, where the voiceless alveolar and voiceless palato-alveolar fricatives /ʃ ʧ/ occurred, she replaced them with voiceless alveolar fricative /s/. The only consistency observed in this part of the data regarding these details is the replacement of a voiceless phoneme with other voiceless phonemes. The acoustic analysis of this instance is presented next.

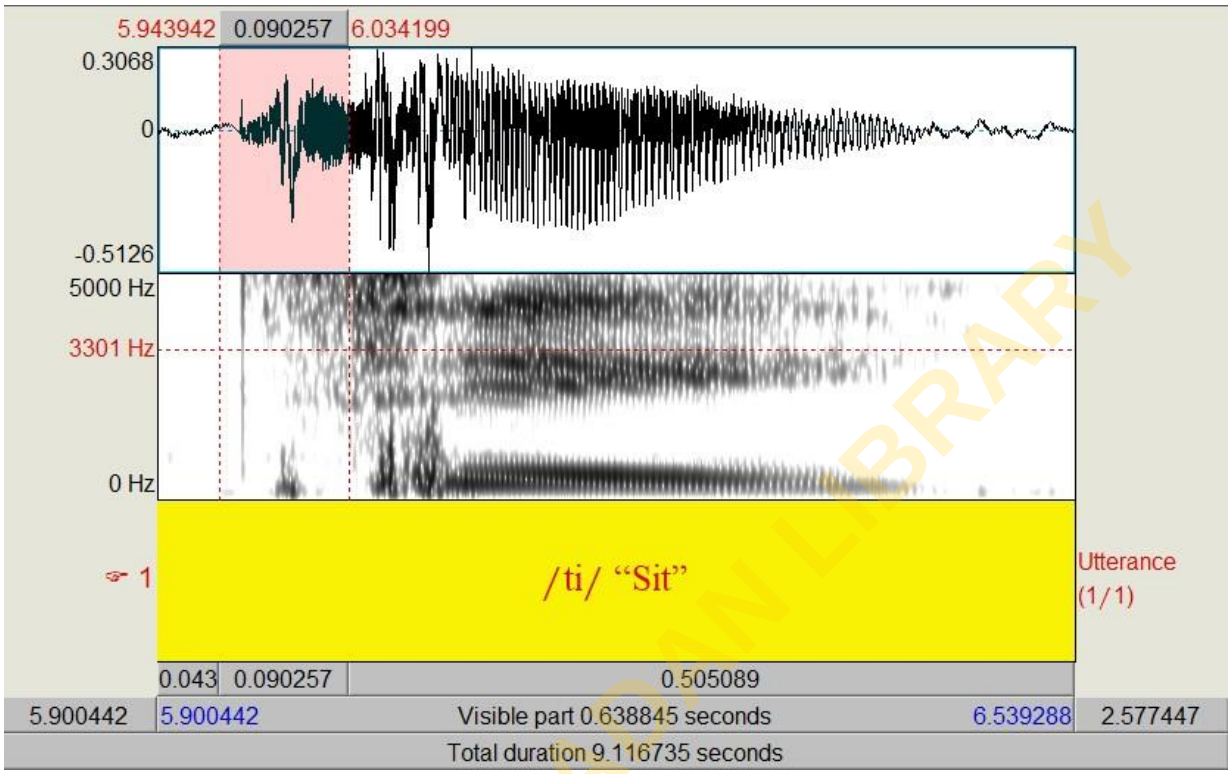


Fig. 4.14 Acoustic analysis of stopping in "Sit" /ti:/ by a one-year-old

The general acoustic features of fricatives and plosives help to immediately realise that the sound on display in the spectrogram is not a fricative but a plosive. This is evidenced by the sudden burst of acoustic energy that begins the spectrogram. The vowel is also recognised by the visible first and second formants. Also, the distance of hertz between the first and second formants indicates that the vowel is a high one.

4.5 Summary

This chapter has presented the analysis of the phonological processes found in selected Nigerian children's spoken English. Their utterances were examined for these processes which were in turn isolated and put into groups, the frequency of these processes were determined and their percentages were calculated using descriptive statistics. Representative instances were analysed theoretically and acoustically. These analyses revealed some phonological features about Nigerian children's processes in spoken English.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter contains the conclusion of the research. It presents the summary of the study and its findings, recommendations, limitations of the study, contributions to knowledge and suggestions for further studies.

5.1 Summary of the study

This study set out to examine children's spoken English for phonological processes and the constraints rankings responsible, with a view to tracing their language development. For this purpose, a purposively designed text was read aloud by one hundred schoolchildren in Oyo and Lagos States, and two children were also observed for a period of six months. Their audio-recorded utterances were transcribed and instances of phonological processes were isolated and subjected to descriptive statistics. Optimality Theory provided the theoretical tool to explain the constraints rankings responsible for the emergence of the processes. Language analytical computer software, PRAAT, was also used to carry out acoustic analyses of some of the processes. The processes were examined descriptively, rather than prescriptively so that no common process was labelled erroneous.

5.2 Summary of findings

Following the research objectives as well as perceptual, theoretical and acoustic analyses, these observations were made about Nigerian children's spoken English.

5.2.1 Phonological processes in the children's language use

The process of coalescence in the children's utterances occurred much more in vowel segments than in consonant segments. This presents a new perspective to what exists in the literature about Nigeria's variety of English. Also, there was a predominant substitution of dental fricatives with alveolar plosives, and dental fricatives were mainly elided when they

occurred contiguously with alveolar plosives. Also, dental fricatives that occurred singly were substituted regardless of where they occurred within a syllable. This finding corroborates what exists already in the literature that dental fricatives are a relatively difficult class of sounds for many Nigerians to produce spontaneously.

Assimilation features occurred beyond the lexical boundaries and was predominantly regressive, only very few instances of progressive assimilation were recorded. This presents a counter-argument to what exists in the literature that assimilation is only regressive in spoken English in Nigeria. Also, consonants were deleted for the purpose of consonant cluster reduction and juncture prosody.

All three central vowels were predominantly strengthened to become either front or back vowels and this finding corroborates the given knowledge in existing literature that central vowels are usually strengthened among many Nigerian speakers of English. Also, there appeared to be no clear modality for the children's preference for diphthongs. The front and back close vowels experienced gliding into semivowels in some contexts.

In the longitudinal data, the younger participant featured intense phonological simplification like whole syllable deletions, numerous cluster reductions, and intra-word devoicing and stopping. However, the older child displayed more adult-like and complex processes like epenthesis, gliding, and vowel strengthening. These complex processes were also characteristic of the cross-sectional data.

Although some processes were found throughout the data, their functions and instances varied based on the participants' ages. For instance, at the outset of language acquisition, deletion was carried out to remove codas, simplify consonant clusters and remove whole syllables, while the older children used this process to reduce strings of phonemes beyond the word boundary.

5.2.2 Constraints ranking for the processes

The children's grammar favoured markedness constraints over faithfulness constraints which permitted the production of peculiar processes. However, as the children grew, their phonological processes became more similar to that of adults which also meant that the same could be said of the constraint rankings. This finding corroborates some Optimality

Theoretical studies on children's phonological grammar. These markedness constraints were also responsible for the production of the children's target phonological processes because their ambient language, Nigerian English, is, in some ways, different from the Received Pronunciation.

In the children's phonological grammar, only vowels were permitted to coalesce and the constraints ranking responsible for this was *COMPLEX^{VOW} » *SCHWA » *COMPLEX. Consonants were prohibited from coalescence and the ranking of constraints that helped to achieve this was UNIF » *COMPLEX » MAX. For the realisation of substitution of dental fricatives, *FRICATIVE was often ranked very highly to achieve this process.

Furthermore, in the achievement of monophthongisation, NODIPHTHONG ranked higher than MAX, while in the process of deletion, *COMPLEX was ranked above MAX. The central vowels were always strengthened through the process of vowel strengthening, thus, *SCHWA ranked higher than all the faithfulness constraints like αF. For the achievement of gliding, the participants ranked *COMPLEX^{VOW} above αF.

Epenthesis thrived by ranking *SS very highly, while devoicing emerged through the joint predominant ranking of FIN DEV and *VOICEDOBS]$_{\sigma}$.

5.2.3 Language development

At the outset of language acquisition, phonemes whose places of articulation are towards the labial region were acquired first. Also, voiceless phonemes were favoured over voiced ones and there was no distinction between pure vowels and diphthongs, rather, pure vowels were used generally. Furthermore, onsets in monosyllabic words were more easily articulated than their codas or consonants in polysyllabic words.

By the age of one year and nine months, enough phonemes would have been acquired for basic expressive communication skills. Between the fourth and fifth year, typically developing children would have begun to strengthen their phonemes and produce complex syllables in their utterances. At about this time also, phonological processes would have begun to take after adults' processes. This shows that language development among typically developing Nigerian children bears a great similarity to the developmental pattern of children in developed countries.

There is evidence in the study to show that participants' acquired words were amassed through interaction with, and imitation of adults who were around them. Nuances from Yoruba language and processes peculiar to it were found in aspects of the data, however, this were quite minimal. A great deal of vocabulary from surrounding adults was found in their utterances too. In other words, the ambient language used in their homes and school influenced what the children acquired. Thus, there are connections between the children's language acquisition and their linguistic environment. Also, gestures that complemented language use were employed. These explain why phonological processes become more similar to adults' as the years pass by. This finding is not accorded enough recognition in child language studies, and is in fact relegated by renowned researchers who claim that innateness hypothesis provides the sole explanation for language acquisition in children.

5.3 Conclusion

Children's phonological processes have been found to be very similar to that of adults around them. This is especially so towards the end of their language acquisition phase. During the outset of acquisition however, the phonological processes are usually very dissimilar from that of adults because they are still learning to adequately master and manipulate their speech organs. Thus, the products of their constraints rankings are different from that of adult speakers. Children favour markedness constraints over faithfulness constraints.

5.4 Recommendations

To further the discussion on phonological processes in Nigerian children's spoken English, especially with a view to tracing their language development, the following suggestions are proffered:

1. Parents', guardians' and teachers' language command, education qualification and ethnic affiliation should be brought into consideration in the data collection phase because these people have an influence on children's language acquisition.
2. Data collection should cover children's language use from acquisition stage till the end so that their developmental progression can be traced, analysed and theorised. Future researchers may do this on a year-by-year basis. This way, each child's progress can be recorded and monitored to arrive at a generalisation for describing

child language development in Nigeria. Also, the transition between the phases of acquisition is recommended for further study.

3. While elicited data and cross-sectional collection are good, longitudinal and naturally occurring utterances should also be focused on because these are likely to contain more processes, which are also in their naturally-occurring state.

5.5 Limitations of the study

First, the process of data collection was strenuous and time-demanding, partly because it involved children. Also, this was the case because the intention was to create a very conducive and comfortable environment for the children so that whatever data was collected would be research-worthy. Despite this however, the schoolchildren's utterances were more slow-paced than expected so that phonemes were distinctly produced from others. Thus, there were fewer processes than expected. Also, the research stage of listening to the collected data proved monotonous and arduous.

Findings from the longitudinal data that was indeed available were not enough to be generalised because they involved only two children. In addition, it was noticed that some of the children read aloud differently from what was in the research instrument and this affected the data collection to some extent.

Acoustic analysis could neither be carried out on all the instances of the process, nor could it be carried out on one instance for all the participants. Thus, acoustic analysis was carried out on only a representative few. Also, the research is limited in the geographical regions it covers – only Oyo and Lagos States were sampled. Finally, the research instrument was not an officially standardized one, rather, it was newly designed just for this study, and may not be devoid of possible problems.

5.6 Contributions to knowledge

Here are the study's specific contributions to literature:

1. Cogno-interactionist theory of language acquisition has been proposed as a more encompassing explanation for the different stages and processes that children undergo to achieve eventual language acquisition.

2. Combining longitudinal and cross-sectional procedures for data collection is a richer way for carrying out empirical research because it affords researchers a more well-rounded view of the data. Also, both complement each other and give research results more authenticity. This has been shown in the research and is therefore, encouraged for future studies.
3. This research has unveiled the importance of embracing the language domain in the description of children's development in Nigeria. Therefore, the Federal Ministry of Health and the Medical and Dental Council of Nigeria are encouraged to ensure that Nigerian hospitals and their medical personnel are equipped with the knowledge and practice of how language domain can also be used to describe and track children's overall development.
4. Child-peculiar phonological structures constitute a small fraction of the reasons responsible for Nigerian children's preference for markedness constraints over faithfulness constraints in phonological grammar. Rather, the distinct peculiarities of Nigerian English which the children eventually come to acquire are responsible for a majority of these markedness constraints.

5.7 Suggestions for further studies

This study is a descriptive research and has explored some phonological processes in Nigerian children's spoken English. It has focused on selected children in Lagos and Oyo States and is thus limited in this regard. Therefore, the following areas are suggested for further studies:

1. More south-western states need to be covered to provide a more well-rounded study on Yoruba Nigerian children's English phonological processes. Also, more researchers can explore other ethnicities in Nigeria as well as other varieties of English that these ethnicities engender.
2. Also, there is a need to carry out more longitudinal studies on a larger number of children so as to further trace language development. This could provide future studies with more language features for Nigerian children's developmental milestones.

3. In the aspect of consonant substitution, only dental fricatives were the centre of focus, future research could include more segments which have been proved to be difficult for Nigerians. Also, all the diphthongs as well as the triphthongs could be tested among these children.
4. Future studies could also collect sociolinguistic information about participants to see how these variables combine to influence children's phonological processes and language development.

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APPENDIX 1

Constraints of phonological processes

The phonological process-related constraints that were used in the course of analysis in this study are presented below.

1. *C]$_{\sigma}$ - Syllables must not have codas. (Borowsky, 1989: p. 145-166)
2. *COMPLEX: a syllable has no more than one consonant in a margin (Wheeler, 2007: p. 3)
3. *COMPLEX^{VOW}: No string of vowels within a syllable (Green, 2010: p. 101)
4. *DIFF$_{[SON]}$: No sonority differences between onset consonants (Pons, 2005: p. 13)
5. *F-ONS: A fricative cannot occupy the onset position (Pater and Barlow, 2003: p. 487-526)
6. *FRICATIVE: Segments may not be [+cont, –son] (Pater and Barlow, 2003: p. 487-526)
7. *SCHWA: The realisation of a central vowel is banned (Wheeler, 2007: p. 8)
8. *VOICEDOBS]$_{\sigma}$ – this may be responsible for coda obstruent devoicing (Mustafawi, 2006: p. 72)
9. AGREE(place): an input and output must have identical features of place (Lamont, 2015: p. 54)
10. AGREE$_{(VOICE)}$: Assign one violation mark for every pair of adjacent consonants whose members differ in their specification for voice (Lamont, 2015: p. 54).
11. FINAL VOICING: Phonemes in syllable coda must be voiced (Lamont, 2015: p. 55)
12. IDENT$_{(MANNER)}$: Assign one violation mark for every manner feature in the input that is different from its corresponding manner feature in the output (Lamont, 2015: p. 54).
13. IDENT$_{(PLACE)}$: Assign one violation mark for every place feature in the input that is different from its corresponding place feature in the output (Lamont, 2015: p. 54).
14. IDENT-IO$_{(VOICE)}$: Assign one violation mark for every voice feature in the input that is different from its corresponding feature in the output – underlying specifications for voice should be respected (Marc van Oostendorp, 2011: p. 3)

15. MAX: No deletion. Every phoneme in the base should have a correspondent in the output (Wheeler, 2007: p. 3)
16. NODIPHTHONG: Diphthongs are prohibited (Green, 2010: p. 101)
17. UNIFORMITY: It penalises segmental coalescence, no coalescence. No element of S_2 has multiple correspondents in S_1 (Wheeler, 2005: p. 62)
18. αF: Correspondent segments in input and output have identical values for [voice], [high] and [cont] (Mustafawi, 2006: p. 76)
19. σCONT: The onset of a syllable must not be of greater sonority than the last segment (Pons, 2005: p. 13)

APPENDIX 2

Reading

Miss Jane had a home **with** a gate. "**I** will plant **a vine next to the gate**," said **Miss Jane**. It will add **a** bit **of blue. I like blue**." **Miss Jane went to the vine shop**. She **got a vine**. It was in a pot.

Miss Jane set the vine in **the sun**. She **fed the vine**. She **gave** it a lot of **water**. **Then**, **there** was **a bud**. "It is not a vine", said **Miss Jane**. It is **a rose**. A red, red **rose**.

In time, the **rose** was big. "**I** am glad **I** got **a rose**," said **Miss Jane with a** smile. **Miss Jane cut the** stem. She **set the rose** in a vase. The **rose** lit up **Miss Jane's home**.

* * *

At my **second year birthday, grandma's yummy cake** was all I ate. **Later**, daddy tuned in to Tom **and Jerry**. Then my friends sang the **birthday** song while **mum combed** my hair. The **last yo-yo** was given to my sister.

* * *

Grandpa and **grandma** will buy new **textbooks** and **biscuits** for us this weekend because school resumes in July. Sophia **and** I have also marked our calendar because we will celebrate our **birthday this** month. We will use our calculator to calculate the remaining days till the celebration. All our favourite cartoon characters on television will be present. We will walk around under an umbrella and even do some magic on our **friends**.

Reciting

1. Rain, rain go **away**
   Come again another **day**
   Little children **want to** play
   Rain, rain go away

2. Aeroplane, **father** aeroplane/2x
   I **want to** be a pilot, Aeroplane
   Like this, like this
   Like this, like this, like this