PATTERNS OF ACQUISITION OF SOUND SEGMENTS AND PHONOLOGICAL PROCESSES AMONG CHILDREN AGED 3-5:11 YEARS IN NAIROBI, KENYA

BY

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A THESIS SUBMITTED TO THE SCHOOL OF ARTS AND SOCIAL SCIENCES, DEPARTMENT OF LITERATURE, LINGUISTICS, FOREIGN LANGUAGES AND FILM STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF DEGREE OF MASTER OF SPEECH AND LANGUAGE PATHOLOGY

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DECLARATION

Declaration by Candidate

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DEDICATION

I dedicate this piece of work to **Ken K. Langat** who encouraged me throughout my studies and all persons with disabilities who have continuously inspired me.

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God bless you all.

ABSTRACT

Speech and language pathologists (SLP) depend on a normative data when assessing and diagnosing client's speech disorders and when choosing intervention targets. This is presented in form of a checklist showing a pattern of acquisition of sound segments. Though the availability of normative data is a necessity, any SLP assessing a Kenyan child on speech sounds development is not at present able to make any clinical judgment. This is because there seems to be no cultural and linguistically relevant norms/checklists that have been established for assessing Kenyan children and this may lead to misdiagnosis. This research reports on the pattern of acquisition of sound segments and phonological processes realized by children in Nairobi, Kenya in the ages of 3- 5years, 11month clients were subdivided into six age levels which represented a six- month period of development. Its objectives were to: determine the pattern of phonemic acquisition in six different age levels, identify the pattern of phonemic acquisition in relation to sex and to establish the pattern of phonological processes in operation. The study used Mowrer's autism theory which explains how children learn speech sounds through imitating their parents as demonstrated in clarity of speech with advancement in age. This aided in the analysis of acquisition of speech sounds in all age levels. Data was collected in eight Early Years Education Centres and one home where there is a variety of children speaking various first languages. This was done using questionnaires, assessment and audio recordings. A standardized assessment tool called South Tyneside Analysis of Phonology (STAP) was used in the study. It consists of coloured pictures of objects. During assessment, each child named the pictures and the target phoneme was recorded either in initial, medial or final position. Quasi-experimental design was used with specific focus on randomized block design and speech samples of 144 children were collected. During data analysis, One- way ANOVA was used to determine the significant difference between the means of six age groups and T-test was used to test acquisition of phonemes according to sex. Descriptive survey was used to analyse phonemes realized. A phoneme was labelled mastered at a particular age level if 90% and above of the clients within an age group correctly produce the target sound. This meant an average of the three sound elements (I, M, F) of each phoneme is realized correctly by ≤90% of all children in an age group. The study revealed that the sequence of sound acquisition of single consonants /p, b, t, k, g m, n, f, w, / were the first to be acquired and the age of acquisition of cluster consonants /sw, sm, sp, bl, sn, fr/ is not later than 4years, 5months. Phonological processes realized are depalatization, voicing, cluster reduction, epenthesis, and stopping. The study also found that some phonemes are mastered earlier by one sex and later by the other. This implies that an SLP should consider both age and sex since some sounds are acquired earlier or later in the age dependinf on sex.

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DEFINITION OF TERMS

Acquisition: a phoneme will be considered acquired if it is correctly produced in any average score in initial, medial and final position.

Age-Group Mastery: Age-group mastery of a phoneme will be assumed when at least 90% of the children assessed at a specific age level correctly produce each phoneme in the three positions.

Clients: These are children who met selection criteria and are sampled for the study, it can also mean participants.

Correct Production: This is a sound element that will be accepted by the speech and language pathologist as conforming to the general population of adult speakers and listeners of Kenyan English.

Culturally secure resources: these are resources used during assessment or therapy that respects client's background and are environment friendly.

Expressive phonology: To communicate using sounds

Mastery: A phoneme will be considered mastered if it is correctly produced in an average score of 90% and above in initial, medial and final position.

Phoneme: This is the smallest unit in the sound system of a language.

Phonological processes/ errors: These are kinds of changes which apply to segments of sounds that children make in simplifying speech.

Realization- This is production of a phoneme.

Sound segments: These are individual speech sounds, each of which gets transcribed with an individual symbol in the International Phonetic Alphabet, IPA

ABBREVIATIONS

ASHA: American Speech and Hearing Association

ASLTK: Association of Speech and Language Therapists Kenya

EYE: Early Years Education

GFTA: Goldman Fristoe Test of Articulation

KICD: Kenya Institute of Curriculum Studies.

L1: First language

NIDCD: National Institute on Deafness and Other Communication Disorders,

SLP/T: Speech and Language Pathologist/ Therapist

SSD: Speech-Sound Disorder

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

This section discusses Speech and language development, normal speech and milestone, atypical speech and language development and language therapy in East Africa and Kenya in particular.

1.1.1 Speech and language development

National Institute on Deafness and Other Communication Disorders, (NIDCD) describe voice, speech and language as tools used to communicate with each other. Voice is the sound made as air from lungs is pushed between vocal folds in the larynx, causing them to vibrate. Speech involves coordinated muscle actions of the tongue, lips, jaw and vocal tract to produce recognizable sounds that make up language. Language is using a set of shared rules that allow people to express ideas in a meaningful way. This may be expressed verbally or by writing, signing, or making other gestures, such as eye blinking or mouth movements, (NIDCD, 2015).

In the first 3 years of life, when the brain is developing and maturing form the most intense period for acquiring speech skills. These skills develop best in a world that is rich with sounds, sights and consistent exposure to the speech and the language of others. The first signs of communication occur when an infant learns that a cry will bring food, comfort, and companionship. New-borns also begin to recognize important sounds in their environment, such as the voice of their mother or primary caregivers. As they grow, they begin to sort out the speech sounds that compose the words of their language, (NIDCD, 2010).

Bowen (2011) described that in speech development, there is gradual progress with age in different areas. She mentioned that these areas are intelligibility (speech comprehensibility and clarity) and phonological development (the organization of speech sounds). She also added that there is gradual phonetic development (ability to produce speech sounds) and phonotactic development which is the ability to produce syllable shapes and word shapes such as CV, CVC and VCC. This therefore mean when children are speaking they have to learn how to apply and regulate features such as word stress, timing of speech events and pause events and prosodic features including rate, intonation, nasality, pitch and loudness.

This is further explained by Adair (1977) that the early years are important for building a baby's brain since everything the baby sees, touches, tastes, smells or hears helps shape their brain for thinking feeling, moving and learning. He stressed that a baby should be talked to in a way that is accurate and simple and holds attention. In addition to this, babies' language development increases with use of Sign language since before they use words they can produce gestures since children exposed to sign language have higher language and IQ scores than kids who are not exposed to signing. Infants and children under 2 should avoid TV and other media entertainment since this may contribute to delay to speech and language development. He also suggested that to promote brain and language development, there is need to spend time reading, talking and singing with your baby.

1.1.2 Normal speech and milestone

Though children follow a natural progression or timetable for mastering the skills of language, they vary in their development of speech and language skills. The milestones help the doctors and health professionals to determine if a child is on track or if he or she needs extra help. Sometimes a delay may be caused by hearing loss; at times it may

be due to a speech or language disorder, NIDCD, 2010). According to Goldman and Fristoe (2000), one of the systematic means of assessing an individual's articulation of the consonant sounds of Standard American English is by using Goldman Fristoe Test of Articulation (GFTA)-2. It provides a wide range of information by sampling both spontaneous and imitative sound production, including single words and conversational speech. This is illustrated in table 1.1 and it presents a checklist of milestones for the normal development of speech and language skills in children from 2 years to 7 years of age.

Table 1.1: Speech sound development chart

Speech Sound Development

Speech Sound Norms taken from the Goldman Fristoe Test of Articulation-2 from 2000.

Age	Initial Sound	Medial Sound	Final Sound
2 years	/b/ /d/ /h/ /m/ /n/ /p/	/b/ /m/ /n/	/m/ /p/
3 years	/t/ /g/ /k/ /f/ /w/	/t/ /g/ /k/ ng /p/ /f/	/b/ /d/ /g/ /k/ /n/ /t/
4 years	/kw/	/d/	/t/
5 years	ch j /l/ /s/ sh y /bl/	ch j /l/ /s/ sh /z/	/l/ ng ch j /s/ sh /r/ /v/ /z/
6 years	/r/ /v/ /br/ /dr/ /fl/ /fr/ /gl/ /gr/ /kl/ /kr/ /pl/ /st/ /tr/	/r/ /v/	
7 years	/z/ /sl/ /sp/ /sw/ th	th	th

This table is the age at which 85% of the GFTA-2 Standardization Sample correctly produced the consonant and consonant cluster sounds.

The above chart shows the age at which 85% of the Goldman Fristoe Test of Articulation (GFTA) standardization sample correctly produced the consonant and consonant cluster sounds. It shows a systematic means of assessing an individual's articulation of the consonant sounds of Standard American English. The table clearly

informed this study that there are particular sounds which are developed earlier than others depending on the age.

Speech and language pathologists use a table like the one shown in table 1.1 during assessment of speech sound disorders. Bowen (2007) explained that if there is doubt about a child's speech sound development, there is need for an assessment and recommendation for speech treatment/therapy if the sound is not appropriate for the child's age or if it is not a feature of a dialect or accent.

1.1.3 A typical speech and language development

Atypical speech and language development is one of the most common developmental difficulties in preschool years. If a child is not meeting the expected developmental milestones for speech and language, Mclaughlin (2011) recommends that a comprehensive developmental evaluation is necessary. This is because in atypical language development, some of the many conditions that can account for speech and language problems in children can be either primary speech and language problems (not attributed to other conditions) or a secondary speech and language problem (attributed to another condition). Among the conditions affecting speech and language development are speech sound disorders discussed below.

Cartier et al. (2006) described speech-sound disorder (SSD) as a complex behavioural disorder characterized by deficits in motor control of the articulatory mechanism and/or deficits in the general processing, organization, and cognitive representation of linguistic information. This is further defined by American Speech-Language-Hearing Association (ASHA) as any combination of difficulties with perception, motor production, and/or the phonological representation of speech sounds and speech segments including phonotactic rules that govern syllable shape, structure, and stress,

as well as prosody) that impact speech intelligibility, (Randolph, 2017). Some of the speech sound disorders discussed below include; Childhood Apraxia of Speech, Dysarthrias, Orofacial Myofunctional disorders, articulation and phonological disorders and stuttering.

1.1.3.1 Childhood Apraxia of Speech (CAS)

Spivey (2008) defines Childhood Apraxia of Speech (CAS) as a motor speech disorder where children have difficulty planning and consistently producing sequences of speech movements using their tongue, lips, jaw and palate. A listener's understanding of the child's speech is limited and the child produces unintelligible speech. The child therefore has problems programming and planning speech movements. Further to this Velleman (2002) explains that CAS interferers with the child's ability to produce sounds and to combine them into syllables, words, phrases and conversations.

In order to speak, messages need to go from the brain to the mouth. The messages tell the muscles how and when to move to make sounds. The messages will not get through correctly if the child has apraxia of speech. The lips or tongue might not move to the right place to produce sounds even though the muscles are not weak. The child knows what to say but the problem is that the brain is not getting the mouth muscles to move. Children with CAS do not follow typical patterns and will not make progress without treatment. With appropriate intensive intervention, significant progress can be made in the child's speech therapy, (Bowen, 2015)

Speech and language pathologists may treat CAS by providing therapy that focuses on practicing syllables, words and phrases rather than isolated sounds. The therapist will observe how the child moves the lips, tongue, and jaws in activities like blowing and smiling, (Mccauley et al., 2006)

1.1.3.2 Dysarthria

According to Freed (2012), dysarthria is “dis-ordered utterance” (dys means disordered or abnormal, arthria means to utter distinctly, from the Greek arthroun). It is the impairment of production of speech because of disturbances in the muscular control of the speech mechanism. It can also be described as a group of disorders denoting speech impairment due to neurological damage, or to conditions that affect the muscle involved in speaking. There are numerous types of dysarthrias; spastic, flaccid, ataxic, hyperkinetic, and mixed. Hypokinetic is mainly seen in Parkinson’s disease in adults. The dysarthrias have many different causes which includes cerebral palsy, neonatal stroke and traumatic brain injury (TBI). The speech mechanism of the affected person may be paralysed, weak or poorly coordinated. It can affect all the motor speech processes including; breathing, production of sounds in the larynx, articulation, resonance and the prosody or rhythm of speech, (McLeod et al., 2017)

1.1.3.3 Orofacial myofunctional disorders (OMD)

Brown (1996) describes Orofacial Myofunctional Disorders (OMD) as patterns involving oral and orofacial musculature that interfere with normal growth, development or function of orofacial structures. OMD can co-occur with a variety of speech and swallowing disorders. Examples of signs of the disorder are; abnormal tongue rest posture, open mouth posture, drooling and interdental lingua contact and distorted production of /s, z/ sounds. No cause has been identified; anything that causes the tongue to be misplaced at rest limits lingual excursions within the oral cavity and makes it difficult to achieve acceptable lip closure and reduces the ability to obtain and maintain correct oral rest postures leading to OMD. Interventions are conducted by an SLP as part of a collaborative team of inter-professionals; for example, certified orofacial myologist, dentist, oral surgeon, orthodontist, plastic surgeon and physical

therapist. When evaluating the speech of OMD clients, assessment by SLP should focus on the placement of the articulators and the rest postures of the tongue, lips and mandible. The articulation errors are expected to be corrected more easily once the behaviour pattern has been corrected in therapy. This is done when an OMD is related to an abnormal lingual or labial or mouth open behaviour pattern that coexists with speech production errors.

1.1.3.4 Articulation and phonological speech sound disorder

According to American Speech-Language-Hearing Association (2017), articulation disorder refers to a child's difficulty producing certain sounds accurately for example, substituting /θ/ for /s/ while a phonological disorder is a child's simplification of an entire sound system beyond an appropriate age; for example, the use of /k/ for /g/. Causes of some speech sound disorders are known. For example, speech disorders can be the result of motor speech disorders like dysarthria and apraxia, structural differences (cleft palate and other craniofacial anomalies) or sensory deficiencies (e.g. hearing impairment). However, the cause of articulation and phonological speech sound disorders is unknown. For a child with communication concerns, a comprehensive speech and language assessment needs to be conducted. This involves; assessing sounds, sound combination, syllable shapes, single word testing and connected speech sampling. There are approaches used by speech and language pathologists for selecting initial therapy targets for articulation and phonological disorders. They include developmental approaches in which target sounds are selected based on order of acquisition in typically developing children. It can also include selection of client-specific targets based on factors, such as relevance to the child and his family e.g. sound is in child's name.

Karugu (2012) studied on identification process of articulation and phonemic disorders in children with communication disorders in primary schools in Nairobi province, Kenya. Out of the 96 children sampled, 48 were girls and 48 were boys ranging in the age category of 6 years to 13 years, 11months.They found out that as children with speech and language disorders articulate words wrongly when they try to communicate with their peers, they are silently affected both academically and psychologically. In addition, they found that, the most highly ranked speech sound disorders were omissions, distortions and substitutions.

1.1.3.5 Stuttering

According to Ogbu (2008), World Health Organization describe stuttering as a disorder in the rhythm of speech in which an individual knows precisely what to say, but at the time is unable to say it because of an involuntary, repetition, prolongation or cessation of a sound. This manifests through involuntary core behaviours; prolongations, stops or repetitions. This might be accompanied by some secondary behaviours; escape (struggle, physical concomitance or pitch rise) or avoidance (interjections or word avoidance)

A person's quality of life and interpersonal relationship is affected since stuttering can make it difficult to communicate with other people. It can also negatively influence job performance and opportunities, and treatment can come at a high financial cost, (NIDCD, 2017)

According to National Institute of Communication Disorders, stuttering is usually diagnosed by an SLP, a health professional who is trained to test and treat individuals with voice, speech and language disorders. Before diagnosis, a number of factors are considered including the child's case history, an analysis of the child's stuttering

behaviours, and an evaluation of the child's speech and language abilities and the impact of stuttering on his/her life, (NIDCD, 2010)

In a study by Yaruss et al., (2006) on treating preschool children who stutter, based on thorough assessment of speech fluency, treatment of stuttering is highly individualized. In creating a treatment plan, an SLP use linguistically and culturally appropriate stimuli and is sensitive to the unique values and preferences of each individual and family. A team approach in treatment is used, where the child and family priorities and desired outcomes drive treatment goals and methods.

In a study on overview on stuttering therapy via telepractice in Kenya, Stevenson (2014) found that there are some helpful tools and questionnaires that SLPs can use to assess clients who stutter, regardless of aetiology. For example, an assessment and evaluation tool for School- Age Children Who Stutter called CALMS (cognitive, affective, linguistic, motor, and social). Another recognized assessment battery for stuttering is, the OASES, or the Overall Assessment of the Speaker's Experience of Stuttering. He further found that people in developing countries have little access to SLP services that people in developed countries take for granted. He looked at the viability of telepractice as a method for provision of speech and language services to those in remote areas of Kenya who stutter. Though according to the current study, there is need to eventually adapt or develop assessment tools for assessing clients who stutter since none currently has been developed in Kenya.

The speech of clients with speech sound disorders discussed above is atypical and need services of speech and language pathologist who must do an assessment before making a clinical diagnosis. An SLP should be conversant with a list of speech sounds (single and cluster consonants) which should be produced correctly by clients within a

particular age limit. An example of a list of speech sounds is the speech development chart shown in table 1.1 developed by Fristoe et al. (2000) from a sample population in USA. This means there in need to have a list of speech sounds mastered per age by Kenyan population to be use by SLP/Ts to assess Kenyan clients. Failure to have this may lead to misdiagnosis of the above disorders. Below is a discussion of the situation in East Africa and Kenya.

1.1.4 Speech and language therapy in East Africa and Kenya

According to Kramer (2019), speech and language therapy/ treatment in East Africa consists of little treatment islands in Nairobi and Mombasa in Kenya, Moshi in Tanzania and Kampala in Uganda, the demand for speech and language therapy is immense. The Spoken Language Assessment Profile- Revised Edition (SLAP-R) is an instrument used to assess language development of children who acquire English as a second language in Sub-Sahara Africa. The development of this tool presents a step forward to establish an individual profiling that can provide insight in to the multilingual language development of African children. The absence of a suitable speech and language assessment tool for use in Africa presents a major hurdle to all involved in setting up clinics, schools or therapy for speech/ language or hearing impaired in English speaking Africa.

In the 6th East African International Conference on Communication disability held in February, 2017 at Kenyatta University, it was clear that the current speech and language therapists in Kenya lack standardized assessment tools. Some of these standardized assessment tools are: clinical evaluation of language fundamentals- preschool, (CELF), pre-school language scale -3UK and South Tyneside assessment of phonology (STAP). SLPs mainly depend on few donated assessment tools and most of these tools are normally out of date and they have unfamiliar toys and or pictures. This is because none

has been developed within East Africa. It was expressed that for effectiveness of SLP/T services, there is need to develop resources that are culturally and linguistically relevant for the future of East Africa.

In a study by Gangji et al. (2015), SLT practice in Tanzania involve the use of assessments tools developed by clinicians in countries such as the UK or US. These tools, which include the Edinburgh Articulation Test and the Goldman–Fristoe Test of Articulation, are not well suited to the local population because they do not take into account the unique aspects of the Swahili language and Tanzanian culture, e.g. the inclusion of pictures unfamiliar to Tanzanian children, and the use of normative data obtained from a different population.

When assessing a child with speech sounds disorder in Kenya, an SLP lists the phonemes which the client articulates correctly. The results are then compared with the norms/checklist. This checklist has a summary of speech sounds that a typical average child at a particular age has mastered. It also lists possible phonological errors realized at particular ages. After comparing with the norms/ checklist, the therapist confirms if the client's speech sound development is normal or has deviated from the norm. Examples of the checklists are speech sound development chart by Fristoe et al. (2000) in Table 1.1 and suggested pattern of acquisition of English consonants by Williamson (2017) in Table 2.1. It is important to note that the two examples of checklists given as examples were developed clinicians UK or USA.

It is clear that, the existing normative data (list of phonemes) in the country was obtained from a different population, designed to assess American or British children to whom English is their first language. Therefore, there is need to have a checklist designed to assess Kenyan Children since they are not using English as their L1.

1.2 Statement of the Problem

For effective diagnosis during speech and language therapy assessment, an SLP must understand the order of acquisition of speech sounds and phonological processes involved. The order can be in the form of a chart or a checklist that clearly shows particular sounds mastered at a particular age by a typically developing/ normal child. This is used to identify whether or not there is a speech sound problem and the therapist can make a clinical decision either for referral or therapy services. A checklist meant to assess acquisition of speech sounds by children who do not use English as L1 is not currently available. This means any SLP assessing a Kenyan child on speech sounds development is not at present able to make any clinical judgment confidently because no local norms/checklist have been established for Kenyan children.

To develop a checklist, a standardized assessment tool should be used during assessment. Since Kiswahili is spoken by majority of Kenyans, a Swahili standardized assessment of phonology tool would be appropriate and later to develop for other local languages. Unfortunately, there is none currently available. Before a Swahili standardized assessment of phonology tool is developed, one of the donated standardized assessment tools currently available and in use in Kenya is called South Tyneside Assessment of Phonology (STAP).

This study therefore sought to understand the pattern of acquisition of sound segments and phonological processes realized by children aged 3:0- 5:11 years in Nairobi by using STAP.

1.3 General Objective

To investigate speech developmental pattern of children in the age range of 3:0-5:11 year in Nairobi, Kenya

1.3.1 Specific objectives

The study was to

i. Determine phonemic acquisition patterns in different age levels,
ii. Establish phonological processes in operation
iii. Identify phonemic acquisition patterns in relation to sex

1.4 Research Questions

i. Does phonemic acquisition pattern increase with age?
ii. Which phonological processes are in operation in the age category of 3-5:11 years?
iii. Does girls' speech develop earlier than boys'?

1.5 Hypotheses

This study assumed that phonemic acquisition increases with age. That girls' speech develop earlier than boys and that phonological processes decreases with increase in age.

1.6 Significance of the Study

Having a list of acquired speech sound will help SLPs to avoid misdiagnosis and inappropriate treatment.

Representing the norms in a chart form makes it easy for use by SLPs during discussions/workshops with parents or trans disciplinary teams on taking note of the sounds the child might be having difficulties with. In case a child has a difficulty being understood with a high number of sounds which are not mastered by a particular age, referral for an assessment would be appropriate.

In the scientific field, this study will inform and guide further research into acquisition of sound segments and phonological processes among children of different ages in Kenya where very few publications exist on this subject.

1.7 Scope and Limitation

The target population of the study was 3.0 to 5.11 year old Kenyan children. Lower age limit of 3.0 years was selected because early developing speech sounds are established by 3.0 years of age as illustrated in speech sound developmental norm chart, (Storkel, 2019). It further illustrates that speech sounds should be clear by 100% by 3 years of age. The upper age limit was selected because by the age of 6, most of the speech sound development will have been established as shown in a combined data from Sander 1972), Grunwell (1981) and Smit et al. (1990).

Data collection area was not safe especially in the slums and the questionnaires and the phone for recording had to be carried in a paper bag to avoid suspicion of any valuables in the bag. Some teachers were not very cooperative in facilitating in the distribution of questionnaires to the children to take to their parents but children took the initiative of asking for questionnaires since they realized their colleagues which had previously carried questionnaires were being shown pictures (during assessment). It was challenging to get clients for the first age group (3:0 -3:5 years) since most children used to join school when they are 3years in January and the data collection was done in July, 2017 when they were already 3.7 years. This led to collection of data in their homes.

The theory which informed the study and the literature reviewed concerning speech development the phonological processes are discussed in the next chapter.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

This chapter first reviews the design and findings of other studies which have examined the development of speech and compare the results of their findings. It then describes and justifies the choice of the theory used to inform this research.

2.2 Literature Review

The literature has been analysed in four parts namely; sound acquisition in relation to age, pattern of phonological processes during speech development and sound acquisition in relation to sex. Thereafter speech and language assessment is discussed.

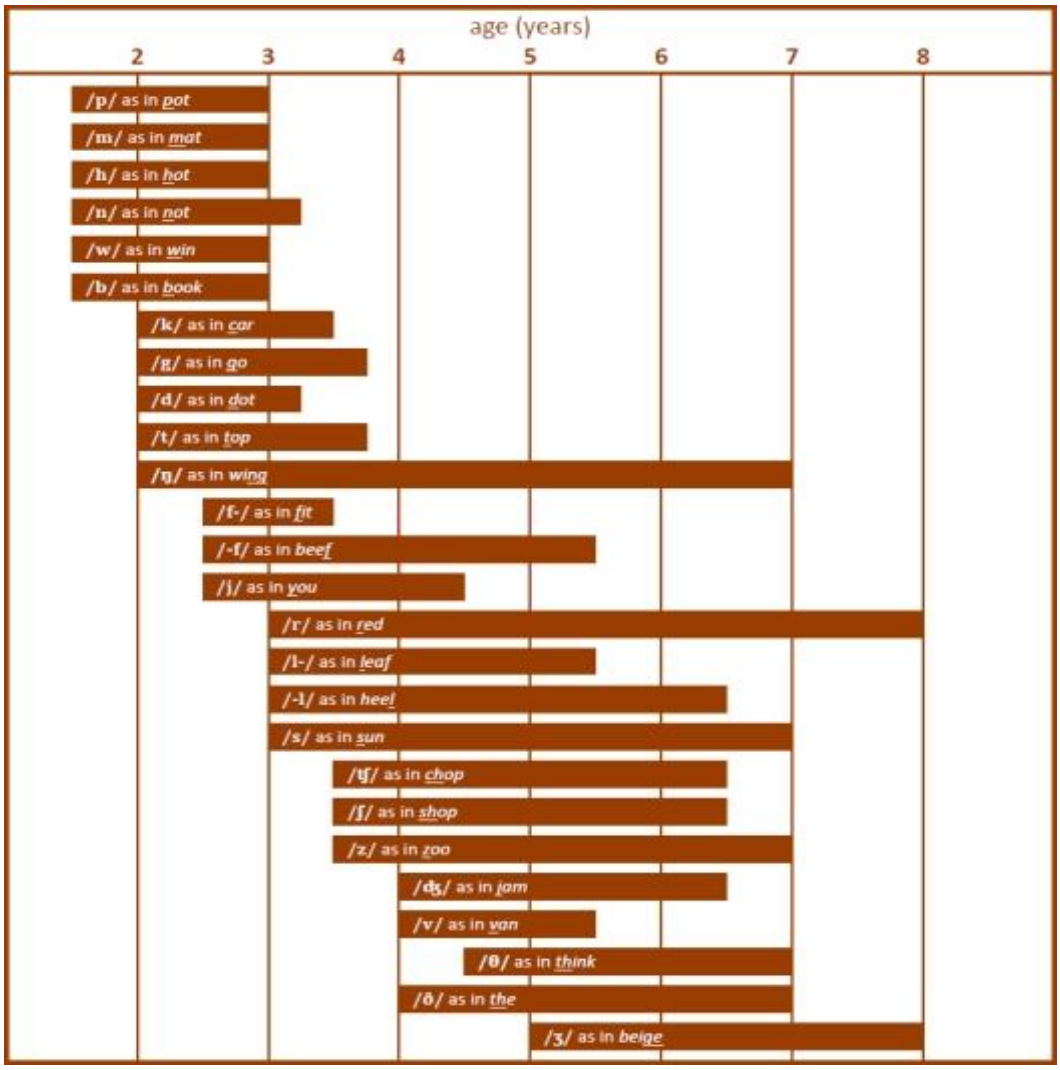
2.2.1 Sound acquisition in relation to age

Williamson (2001) described a normative data as a data that characterize what is typical of a particular large group at a specific point in time and that it provides summary descriptions of the behaviour of a group. He further expressed that in order to understand the order of acquisition of speech sounds, researchers like Grunwell (1981), Smit et al. (1990) and Fristoe et al. (2000) have studied large groups of children and identified particular speech sounds that are used at a particular age. Their investigations summarize what is typical of an average child at a particular age. Such investigations therefore allow summary statements like, 'We do not expect a child of one year to be using the sound /r/ (as in the word rabbit).' This is because it is not the norm that a one year old child would be using the sound /r/. It is precisely because there is normative data available that such claims can be made.

A speech sound development chart shows a normative data that identifies which particular speech sounds are used, on average, at a particular age. The table below

presents a summary of a normative data combined from Sander (1972) , Grunwell (1981) and Smit et al. (1990).

Table 2.1: Suggested pattern of acquisition of English consonants.



In the above table, the left-hand edge of each horizontal bar represents the age at which 50% of children produce the particular consonant correctly and use it in their speech. The right-hand edge of each horizontal bar represents the age at which 90% of children have mastered the use of the particular consonant in their speech. Since the table is constructed from several sources it is to be used only as a guide to a likely pattern of

acquisition. The table only shows data for consonants since vowels are generally considered to have been acquired by the age of 3 years.

This information guided the current study in the decision to sample children from the age of 3 years and to assess them on mastery of consonants and not vowels. It also guided in the data analysis of a phoneme being considered mastered if 90% and above of the participants have articulated correctly.

According to Weybright (1974), schedules of speech sound development lists specific phonemes of the language and the ages at which sounds are mastered by normal children. This indicates that certain sounds therefore, must be mastered before others can occur. This is further shown clearly in Table 1.2, a data compiled by McLeod and Bleile, (2003). It shows a typical speech development patterns for English-speaking children organized according to children's ages to reflect the typical developmental sequence. They presented data from more than one study for each category at each age to allow for comparison and to encourage consideration for diversity and individuality. Though the original data is from 0-6 years, for the purpose of the present study, the researcher opted to select from age 3.0 -6.0. It displays the single consonants and cluster consonants in two different tables.

Table 2.2: Speech development for English speaking children (consonants)

	Acquired sounds :Consonants		
Age	**Females**	**Males**	
3.0	/m, n, h, w, p, b, t, d, k, g, f, s/	/m, n, h, w, p, b, t, d, k, g/	(Smit, et al., 1990)
	/ m, n, h, g, p, ŋ, w, t, d, k, j, f/	/ m, n, ŋ, d, p, b, h, w, k, g/	(Chirlian & Sharpley, 1982)
	/h, ŋ, p, m, w, b, n, d, t, k, ʒ, f/	/h, ŋ, p, m, w, b, n, d, j, g, ʒ/	(Kilminster & Laird, 1978)
3;6	/ j /	/ j, f /	(Smit, et al., 1990)
	/ b, ʃ, ʧ, s/	/j, t, f, l, , ʧ, ʤ, ʃ/	(Chirlian & Sharpley, 1982)
	/ j, g, l /	/ k, f /	(Kilminster& Laird, 1978)
4;0	/m, n, h, w, p, b, t, d, k, g, f, s, j, v, ð, ʃ, ʧ/	/m, n, h, w, p, b, t, d, k, g, j, f , ʤ/	(Smit, et al., 1990)
	/ m, n, h, g, p, ŋ, w, t, d, k, j, f, b, ʒ, ʧ, s, l, ʒ, ʤ/	/s, m, n, ŋ, d, p, b, h, w, k, g, j, t, f, l, ʧ, ʃ, ʤ, s/	(Chirlian & Sharpley, 1982)
	/ h, ɳ, p, m, w, b, n, d, t, k, ʒ, f, j, g, l, ʃ, ʧ, ʤ/	/ h, ŋ, p, m, w, b, n, d, j, g, ʒ, k, f /	(Kilminster & Laird, 1978)
	/ p, b, t, d, k, g, m, n, , h, f, w, v, s, z, ʒ, ʧ, ʤ, l/		(Arlt & Goodban, 1976)
	/m, n, ŋ, h, p, j, d, k, f, w, b, t, g, s, l, r, ʃ,ʧ, ð, ʒ/		(Prather, Hedrick, & Kern, 1975)
	/ p, b, t, d, k, g, m, n, ŋ, f, v, s, z, h, w, l, j, ʧ, ʒ, ʤ/		(Dodd et al., 2003)
4;6	/ʤ, l/	v, z/	(Smit, et al., 1990)
	/s, z, r/	/t, l, , ʧ, ʤ ,ʒ/	(Kilminster & Laird, 1978)
		/ʒ	(Chirlian & Sharpley, 1982)
	/ʃ/		(Arlt & Goodban, 1976)
5;0	/m, n, h, w, p, b, t, d, k, g, f, s, j, v,ð, ʃ, ʧ, ʤʒ, l , z/	/ ʃ, m, n, h, w, p, b, t, d, k, g, j, f , ʤ, v, z, s, ʒ, ʧ/	(Smit, et al., 1990)
	/r, m, n, h, g, p, ŋ, w, t, d, k, j, f, b, ʃ, ʧ, s, l, ʒ, ʤ, v/	/ m, n, ŋ, d, p, b, h, w, k, g, j, t, f, l, ʃ, ʧ, ʤ, s, ʃ, r/	(Chirlian & Sharpley, 1982)
	/h, ŋ, p, m, w, b, n, d, t, k, ʒ, f, j, g, l, ʃ, ʧ, ʤ, s, z, r/	/h, ŋ, p, m, w, b, n, d, j, g, ʒ, k, f, t, l, ʃ, ʧ, ʤ, r/	(Kilminster & Laird, 1978)
	/ p, b, t, d, k, g, m, n, ŋ, h, f, w, v, s, z, ʒ, ʧ, ʤ, l, ʃ, θ, ð, r		(Arlt & Goodban, 1976)
	/ p, b, t, d, k, g, m, n, f, v, s, z, h, w, l, j, ʧ, ʒ, ʤ, ʃ/		(Dodd et al., 2003)
5;6	/ɳ, θ/	/ð, r/	(Smit, et al., 1990)
	/ v/		(Kilminster & Laird, 1978)
6;0	/r/	/ŋ, θ, z, l/	(Smit, et al., 1990)
	/r/		(Dodd et al., 2003)

In Table 2.2, acquired sounds means the age at which a certain percentage (often 75%) of children have acquired a phoneme in initial, medial and final position in single a word. As the table above demonstrates, Smit et al. (1990) and Chirlian and Sharpley (1982) found out that /m, n, h, w, p, k, g, f/ are acquired by the age 3.0 years. Some of these sounds develop at the age of 3.6 years according to a study by Kilminster and Laird (1978)

More phonemes are acquired as age increases and this concurred with the current study as shown in the table. For example, in a study by Chirlian and Sharpley (1982), /m, n, h, g, p, ŋ, w, t, d, k, j, f/ are acquired by 3 years old and /ʃ, ʧ, ʤ/ are acquire by 3.6 years. Reaching the age of 4 years, /d, ʒ/are acquired and /r/ is acquired by 4 years.

Table 2.3: Speech development for English-speaking children

Acquired sounds : Consonant clusters			
Age	**Females**	**Males**	
3: 6	/tw, kw/	/tw, kw/	(Smit, et al., 1990)
4: 0	/tw, kw, pl, bl, kl/	/tw, kw/	(Smit, et al., 1990)
	/tw, kw, sp, st, sk, sm, sn, pl, bl, kl, gl, pr, br, tr, dr, kr/		(Templin, 1957)
4:6	/tw, kw, sp, st, sk, sw, pl, bl, kl, gl, fl, kr, skw/	/tw, kw, gl/	(Smit, et al., 1990)
	/tw, kw, sp, st, sk, sm, sn, pl, bl, kl, gl, pr, br, tr, dr, kr, gr, fr/		(Templin, 1957)
5: 0	/tw, kw, sp, st, sk, sw, pl, bl, kl, gl, fl, kr, skw/	/tw, kw, sp, st, sn, bl, gl, dr/	(Smit, et al., 1990)
	/tw, kw, sp, st, sk, sm, sn, pl, bl, kl, gl, fl, pr, br, tr, dr, kr, gr, fr, skw, str/		(Templin, 1957)
5: 6	/tw, kw, sp, st, sk, sm, sn, sw, pl, bl, kl, gl, fl, kr, skw/	/tw, kw, sp, st, sn, pl, l, kl, gl, fl, pr, tr, kr, gr, fr, dr/	(Smit, et al., 1990)
6: 0	/tw, kw, sp, st, sk, sm, sn, sw, sl, pl, bl, kl, gl, fl, pr, br, tr, dr, kr, gr, fr, skw, spl/	/tw, kw, sp, st, sk, sn, sw, pl, bl, kl, gl, fl, pr, br, tr, kr, gr, fr, dr/	(Smit, et al., 1990)

Cluster consonants

It is clear in Table 2.3 that consonant clusters are acquired after the age of three and by the age of six most consonant clusters have been acquired. According to Smit et al.

(1990), /tw/ and /kw/ are acquired by 3:6 years, /pl, bl, kl/ by 4years, / sw, gl, fl, kr, st, sk, skw/ by 4:6 years and lastly /dr, sn/ by 5 years.

In Tanzania, Gangji et al. (2015) sampled 24 typically developing first language Swahili-speaking children between the ages of 3:0 and 5:11 years in Dar es Salaam. Single-word speech samples were obtained from each child using a set of culturally appropriate pictures designed to elicit all consonants and vowels of Swahili. In their study they found gradual progression in the acquisition of speech sounds and syllables between the ages of 3: 0 and 5:11 years. Fricatives /z, s, h/ were mastered at 4 years and /θ/and /r/ were the last mastered consonants at age 5:11 years.

Amateshe (2011) had a study on speech development and intervention techniques in children with downs syndrome (DS) and cerebral palsy (CP) in Thika, Kenya. The study aimed at establishing the speech ability of these children at the time of the study, the varying chronological ages at which they develop speech and the intervention techniques employed to promote speech development. The study found out that children had speech problems due to their conditions, CP and DS. It was recommended that there is need for teachers to support these children to make useful speech to help them communicate especially the basic needs. Though the study described speech development of children in Kenya, it is contrary to the current study since the sample selected was atypical. The current study used children who do not have disabilities and with no history of being assessed /typical.

Although several studies have been conducted in order to provide normative data about the development of speech sounds, Williamson (2001) expressed that different methods have been used by the researchers to collect data. Some studies collected examples of speech sounds by having the children imitate words that the researchers spoke first and

other studies have used samples of non-imitated, spontaneous speech. Some studies have put more emphasis on analysing children's production of single words, whilst others have given more weight to investigating words spoken in a series. This highlight the fact that there is no universal answers to questions such as, 'What speech sounds will a three-year-old be able to say?' or 'When will my child start using the sound /l/?' The answers depend on which set of normative data is chosen to be referred. He further described that there are two main methods involved in the process of collecting normative data. One method is to identify a large group of typical children across a wide age range. A record of all the speech sounds that each child uses should be made. A chart is then drawn having particular speech sounds that each age range uses. The other main method would be to select a group of typical children who are the same age for example, 6 months old – and to follow them for several years, keeping a record of the speech sounds that they use at particular ages as they grow older. This method is time-consuming.

The current study used the first method of data collection by identifying typical children (those who do not have disabilities and with no history of being assessed).

In the literature reviewed, different studies showed specific ages at which sounds are mastered by normal/ typical children. For example, Dodd et al. (2004) studied children within the age of 3-6:11, Smit et al. (1990) had s study of children within the age of 3-9 and Gangji et al. (2015) had a study of children within the age of 3:0 to 5:11. The age category was generally from 2:6 years and 9years.This guided the current study in the decision to investigate the sounds mastered by children within the age of 3:0 to 5:11years, bearing in mind that vowels are mastered before the age of 3 years.

2.2.2 Pattern of phonological processes

According to Bowen (2011), when learning to talk like adults, all children make predictable pronunciation called phonological processes or phonological deviations. She explained that when learning the adult sound –system of English, common phonological processes are found in children's speech. This is illustrated below.

Table 2.4: Phonological Processes in typical speech development

Phonological Process	Example	Description
Pre-vocalic voicing	car = gar	A voiceless sound preceding a vowel is replaced by a voiced sound.
Word final devoicing	red = ret	A final voiced consonant is replaced by a voiceless consonant
Final consonant deletion	boat = bo	A final consonant is omitted (deleted) from a word.
Velar fronting	car = tar	A back sound is replaced by a front sound.
Palatal fronting	ship = sip	sh or zh are replaced b y s or z respectively
Consonant harmony	cup = pup	The pronunciation of a word is influenced by one of the sounds it 'should' contain.
Weak syllable deletion	telephone = teffone	Weak (unstressed) syllables are deleted from words of more than one syllable.
Cluster reduction	try = ty	A cluster element is deleted or replaced.
Gliding of liquids	ladder = wadder	Liquids are replaced by glides.
Stopping	ship = tip	A stop consonant replaces a fricative or affricate.

She further described that when a child continues to make errors in sound patterns or sound blends beyond the age when other developing children have stopped or when the processes are used much differently than normal, speech disorders manifest.

Dodd et al. (2004) had a normative study on phonological development of British English-speaking children. They had speech samples of 684 children aged between the 3:0 and 6:11 years in UK and discussed the effects of age, gender and socio-economic status on speech sound development. The study found that there is gradual progression of speech accuracy. Older children had more accurate production and fewer error patterns in their speech. Majority of the error patterns resolve rapidly between 2:5 -4:0

years. For example, voicing is resolved by 3:0 years, stopping by 3:6 years, weak syllable deletion and fronting by 4 years. Deaffrication and cluster reduction is resolved by 5:5 years and finally liquid gliding persists up to 6 years. This was evidenced in their articulation which had more correct sounds and the error patterns were fewer. This concurred with a study by Gangji et al. (2015) that older children produce speech sounds more accurately and have fewer phonological processes in their speech than younger children.

In South Africa, Maphalala et al. (2014) sampled 24 typically developing first language isiXhosa- speaking children aged 3:0 to 6:0 years. Using culturally and linguistically appropriate pictures to elicit single word responses, they found that phonological processes realized by children were deaffrication, stopping and gliding of liquids. In addition, they found that children had acquired most isiXhosa phonemes by 3:0 years but aspirated plosives, affricates, fricatives and clicks had not been mastered. Since affricates and aspirated plosives were still developing in the 5year old children; this suggested that these may be the latest acquired segments.

From the literature reviewed, some phonological processes realized are the same despite the difference in languages spoken by the children. For example, English-speaking children sampled by Dodd et al. (2004), isiXhosa-speaking children sampled by Maphalala et al. (2014) in South Africa realized voicing, stopping and deaffrication. In the contrary, some phonological processes are realized in one study and not in other. For example, gliding of liquids was realized by isiXhosa-speaking children but not realized in the study of Dodd et al. (2004) . Though a study by Gangji et al. (2015) used Swahili-speaking children and Dodd et al. (2004) used English- speaking children, they had same conclusion about phonological processes. That is, children

produce speech sounds more accurately and have fewer phonological processes in their speech than younger children.

2.2.3 Sound acquisition in relation to sex

According to Newbury (2016), speech sound acquisition are an area in which sex differences favouring girls persist and this reaches statistical significance at the age of six. She explains that boys start at the age of 3:6 and 4:0 to slowly decrease in the acquisition of clusters compared to girls.

According to a study by Dodd et al. (2004) gender did not exert an influence on speech accuracy until children were 5:6 years. They found that in the oldest age group, girls performed better than boys on all of the speech accuracy measures. In addition to this, Poole (1934) claimed that gender differences would only become apparent after 5:6 years with girls having a more rapid growth rate and completing sound acquisition one year earlier than boys. Further to this, Petheram and Enderby (2001) reviewed the demographics of clients referred to speech and language therapy at 11 centres over 9 years. They reported a consistent gender bias with two females referred to every three males. On the contrary, Smit et al.(1990) sampled children in the age range of 3-9 years to provide normative information about speech sound acquisition. They described that sex of the child had a significant influence in some of the preschool age groups.

2.2.4 Speech and language assessment

According to Kenneth and Julie (2009) assessment is a process of collecting valid and reliable information, integrating it and interpreting it to make a judgment or a decision about something. Its outcome is a diagnosis which is the clinical decision regarding the presence or absence of a disorder. Freiberg et al. (2003) described that when assessing clients whose dominant language is not English, it is important to establish the native

language or language the child appears to understand best. In addition, it is important to be familiar with the phonological and linguistic system of the client's dominant language. This information assists an SLP in determining if the client has language impairment or a difference due to the linguistic or cultural differences.

American Speech-Language-Hearing Association, ASHA (2016) explained that during assessment, SLPs use standardized assessments, empirically developed evaluation tools with established statistical reliability and validity. It is a test that requires all test takers to answer same items/ questions in the same way and that is scored in a standard or consistent way, and making it possible to compare relative performance of individuals or group of individuals. Among the several assessment methods and approaches that are appropriate for a valid and reliable collected assessment data are norm-referenced tests and criterion referenced.

Norm referenced tests as standardized tests designed to compare and rank test takers in relation to one another. This makes it possible to compare an individual's score(s) with those of a large group of statistically selected individuals- usually of the same age or grade level – who have already taken the test. In addition, it is reported in percentile rank, (ASHA, 2016)

Contrary to norm-referenced tests, Kenneth and Julie (2009) explained that criterion-referenced tests do not compare an individual's performance to anyone else's ; rather they identify what a client can and cannot do compared to a predefined criterion. The test assumes that there is a level of performance that must be met for behaviour to be acceptable. This type of test is appropriate when assessing a client with aphasia since it is not helpful to compare the client's speech and language skills to a normative group.

They are also often used when assessing clients for neurogenic disorders, fluency disorders, and voice disorders.

Norm referenced assessment method was selected as an appropriate method for the current study. This is because during data analysis, study sought to understand the phonemes mastered by a specific age category and an individual's child performance was compared to the group's performance. The scores of a client (in percentage) were compared with the scores of other clients of the same age category which comprised of 24 clients.

2.3 Theoretical Framework

Drawing from the early work of Poole (1934), Wellman et al. (1931), Templin (1975) and Prather et al. (1975), speech and language pathologists have been more concerned with the order of sound acquisition. These studies helped pathologists to determine the order in which sounds were supposed to be acquired by young children. This same orderly sequence could be followed in teaching speech sounds to children who were delayed in articulation development.

2.3.1 Mowrer's autism theory

The present study used Mowrer's autism theory which was formulated by Mowrer (1980). It represents an attempt to explain in terms of learning how children learn speech sounds and it is concerned with how children learn to imitate speech sounds. Mowrer observed how trainers taught birds to talk, and decided that the most efficient procedure was to put a caretaker in charge of administering a primary reinforcer, food. The caretaker could talk to the birds when presenting food and the primary reinforcer (food), therefore was paired with the words spoken by the caretaker. After many such pairings, the caretaker's words took on some of the reinforcing properties of the food.

These words became secondary reinforcers since they served to remind the bird of food; that is, the bird anticipated receiving food when certain words were spoken by the caretaker. Once the connection was made between the caretaker's words and receiving food (when the words became conditioned reinforcers), the bird may accidentally produce a sound that resembled one of the caretaker's sounds or words. Since this sound was a secondary reinforcer, the bird was reminded of the pleasant state of receiving food, it was a kind of food substitute. The likelihood that the bird would produce more of these sounds that resembled the caretaker's sounds was increased. At the same time, the more accurate the bird's imitations of the caretaker's words, the more these reproductions would be reinforced in the bird. Soon, the bird learnt to reinforce itself independent of the caretaker's presence.

In developing his autism theory, Mowrer stated that infants learn to produce sounds like those produced by the parents in much the same way as birds learn to imitate sounds of their caretakers. That is, they produce certain sounds because these sounds take on self-reinforcing (autistic) properties. He further explains that mothers talk to their children during feeding periods as well as when performing other pleasure-producing care duties (changing diapers, bathing the baby, and so on). Since the infant vocalizes many sounds while engaging in reflexive behaviours, vocalizations that approximate those produced by the mother (i.e., secondary reinforcers) also become pleasure-producing to the infant. This is because of their indirect association with comforting and food-intake situations. The infant continues to produce these sounds (self-stimulation) that resemble the mother's sounds. It is also likely that the mother will respond positively to sounds that resemble those she uses, and consequently she selectively reinforces these sounds. On the other hand, she will probably not attend to sounds that do not resemble those produced by the community.

From a theoretical viewpoint, autism theory makes sense but there are gaps between the theory and the evidence from studies of children who are in the active process of acquiring sounds. One important fact that Mowrer's theory does not explain is why infants acquire sounds in an orderly pattern. Why do some sounds occur early in infant vocalization and others appear late? This therefore implies that imitation seems to be inadequate as the sole explanation of sound acquisition. Though the theory has gaps, the current study is not investigating why infants acquire sounds in an orderly manner. In contrary, the theory guided the study in understanding how children learn speech sounds especially by imitation and how it improves with advancement in age.

Winitz (1969) elaborates upon Mowrer's theory by presenting a detailed discussion of three early stages of phonological development, each over-lapping the other. He reasons that the first two stages occur before the child is one year old; the third, after the first year. During the first stage of fractional anticipatory goal response, the infant produces vocal sounds associated with food intake. These include the sounds made while chewing, sucking, swallowing, lip-smacking, as well as various clicking-like sounds. These sounds, occurring during the second and third months, frequently precede feeding and become associated with the pleasurable act of eating. Thus, since they are reinforced, they should occur with greater frequency as the infant matures. The second stage focuses primarily on sounds that occur during infant babbling. Frequently, the mother's vocalizations precede and accompany feeding as well as other pleasure-producing activities. These vocalizations take on secondary reinforcement characteristics and gradually come to resemble adult words in such characteristics as phoneme, syllable, loud-ness, and stress features. Although Winitz is not entirely satisfied with this concept as an explanation of why the infant gradually produces sounds similar to adult speech, he believes that the principle of conditioning comes

close to explaining how sound acquisition develops. The third stage begins when parents recognize some of the child's vocal productions as word approximations and directly reward these attempts with social praise. This occurs shortly before or after the child's first birthday. Gradually, the child refines the articulation of these words attempts until they closely approximate the adult speech model. Winitz uses Skinner's (1957) concept of shaping through successive approximation as descriptive of this process. Winitz also stated that the phonological system is not acquired in isolation but as part of the acquisition of syntactical aspects of language as well as of perceptual abilities.

Guided by Mowrer's autism theory together with elaborations done by Winitz, there is concern about how children learn to imitate sounds and the theory affirms that infants learn to produce sounds like those produced by the parents and on the other hand, they fail to attend to sounds that do not resemble those produced by the community.

The theory explains three different stages of sound acquisition development. In the first stage, sounds produced by infants in the second and third months precede feeding and become associated with pleasurable act of eating. The second stage is babbling and the mother's vocalizations precede and accompany feeding and gradually come to resemble adult words in such characteristics as phoneme and syllable. In the third stage parents begin to recognize some of the child's vocal productions as word approximations and directly reward these attempts with social praise. The child gradually refines the articulation of these words attempts until they closely approximate the adult speech model. This guided the current study in the decision to sample children in different age levels of 3:0 to 5:11 years. In the theory, there was a difference in the sounds produced in the second and third month, babbling age and in the third stage where the child

refined the articulation of words. This guided the study during data collection and analysis that speech sounds mastered earlier in age were less compared to those mastered at an older age. This implies that more speech sounds are articulated clearly with advancement of age. The theory describes feeding, mother's vocalization and social praise as pleasurable rewards a child gets after babbling and trying to articulate a sound. It was pleasurable too for clients during data collection as they identify the pictures in the STAP tool. They were curious and anxious to get the chance since this was done individually.

Apart from a study made by Maphalala et al. (2014) and Gangji et al. (2015), all children sampled in the literature reviewed are English-speaking and they use English as their L1. For example, Dodd et al. (2004) sampled British English speaking children, Smit et al. (1990) sampled children in the USA and McLeod and Bleile (2003) sampled in Australia. Interestingly, their findings (sounds which are mastered per age category) are currently used by SLPs to assess Kenyan children yet English is not used as a first language. This informed the current study to have children from Africa, Kenya in particular so that the findings of the sounds mastered per age can be used during assessment.

The current study chose to identify English phonemes and not any of the local languages spoken in Kenya because of two main reasons. First, currently there are less than twenty SLP/Ts in the country and they mainly use either English or Kiswahili to communicate to clients who speak different first languages. This means choosing to identify phonemes for a particular local language means only the speakers of that language will benefit yet SLP/Ts are currently few. This however is very necessary but does not address the current urgent need to serve of multilingual Kenyan children who

are multilingual and have communication disorders. Secondly, identifying the norms/ a checklist demands the use of a standardized tool. Currently, the only available tool was STAP. Finally, to identify phonemes mastered per age of a particular local language first requires developing of a standardized tool like STAP. This tool is then used (through assessment) to identify phonemes. This also means the tool will be limited to speakers of the local language alone.

From the literature reviewed, there are common phonological processes realized by English- speaking children in UK, isiXhosa- speaking children in South Africa and Swahili speaking children in Tanzania. The current study needed to understand the phonological processes realized by Kenyan children who use English as L2.

The literature reviewed claimed that there are gender differences in sound acquisition. This was seen in the studies of Poole (1934), Smit et al. (1990), Petheram et al. (2001) and Dodd et al. (2004) . This greatly informed the current study in deciding to collect data of speech acquisition from both boys and girls to confirm if there is gender difference.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter describes the research design used in the study and shows the methods and instruments used in collecting the required data. It also looks at the methods used in analysing and interpreting the data. The data collected was from primary sources from 3-5:11 year old children in Nairobi, Kenya.

3.2 Research Design

The study used quasi experimental design with specific focus on randomized block design. The design was chosen because clients who met the selection criteria were not randomly selected but were grouped according to blocks. They were first divided into two groups/ blocks; one for boys and another for girls. Each block had 72 clients who were randomly selected so long as they met the selection criteria.

3.3 Study Site

The study was carried out in Nairobi County which is one of the 47 Counties in Kenya. Since Kenya is multilingual the county was chosen since it has children from different parts of the country who speak different first languages and this reduces bias.

All participants were assessed in early years education centres (EYEC) apart from 3 girls and one boy who were assessed in their homes. This was because the targeted age levels of 3 years to 5 years and 11 months are either in baby class/ play group, pre-primary one or pre-primary 2 which form the EYEC.

All the clients assessed (144) were from only two Sub Counties: Dagoretti South and Westlands. The other Sub Counties were not visited because it took time to process

permission from the Education offices before proceeding to schools and the time line for data collection was relatively short. This however, did not affect the overall aim of choosing children with different first languages from Nairobi. To avoid bias of the intervening variables of socioeconomic status, the study chose clients from high (private schools) and low socioeconomic status (slums). However it was not possible to get half of the clients from private and the other half from slums. In some circumstances, a few clients for a particular age level were less in either private or slums and this led to getting an uneven number in either group.

3.4 Study Population

According to the 2016 statistics in Nairobi County EYEC, there are 27,314 children between the ages of 3 years and 6 years. This study attempted to represent the population of children between the ages 3:0 to 5:11 (years: months hence forth) years in Nairobi County. Data was collected from 144 clients; 72 girls and 72 boys within the age range of 3:0 -5:11 years. The table below summarizes distribution of clients per learning institution.

Table 3.1: Clients per institution

	Institution	Girls	Boys	Total	% of total
1	A	14	16	30	21%
2	B	6	10	16	11%
3	C	7	4	11	8%
4	D	1	1	2	1%
5	E	10	5	15	10%
6	F	21	17	38	26%
7	G	4	10	14	10%
8	H	6	8	14	10%
9	Homes	3	1	4	3%
	Total	**72**	**72**	**144**	**100%**

In the table 3.1, some institutions had more clients than others. This could be because either the school had fewer numbers of children within the target age group or the

researcher needed a particular number of clients to for a particular age group. For example, out of 12 girls needed in the age group of 3:0 –3:5, there might be 10 in school A and the researcher would be looking for only two more in school B.

3.5 Sampling and Sample Size

The study used stratified random sampling. The target variables were first identified as age and sex. This involved division of the population into two groups (girls and boys).

Fisher et al. (1998) formula was used as stipulated below:

$$n = \frac{Z^2\, p.q}{d^2}$$

n = sample size

p = proportion of target population estimated to have a particular characteristic, hence was equal to 90% (0.90): the level which phonemes should be articulated correctly during normal speech development with regard to different age groups.

Q = derived from a relationship, 1-0.90 which is equal 0.10

Z is the standard normal deviation set at 1.96 to correspond to 95% confidence limit.

d represents the level of precision (degree of set accuracy) and is set at 5% (0.05)

$$n = \frac{1.96^2\ x\ 0.9x\ (1 - 0.9)}{0.05^2}$$

$$n = \frac{3.84\ x\ 0.09}{0.0025}$$

n = 138.24

A sample size of 138 was divided into two (according to sex) and the results were 69. This number, 69 was further divided into 6 (age categories) and the results were 11.5. It was then rounded off to the nearest 10 and the results were 12. This meant 12 clients

from each age category were selected resulting to 72 clients per sex and a total of 144 clients in the study. The figures of participants per school/institution are shown in Table 3.1.

3.6 Inclusion and Exclusion Criteria

To be included in the study a child was to be between the ages of 3:0 and 5:11. Lower age limit of 3:0 was selected because most findings indicate that early developing speech sounds are established by age 3:0. An upper age limit of 5:11 was selected, because by the age of 6, most of the speech sound development will have been acquired according to the English norms of speech development.

Apart from a child being within the age category of 3:0 and 5:11, he or she was supposed to have no parental or teacher concern about speech, language, cognitive development. Clinical significance was a factor in the determination of the age group to investigate since most referrals for speech and language assessment and treatment are for children between three to six years of age and the findings of the present research would be applied/ used in the clinic. It is also an important period to prepare the children for school performance and readiness.

Children whose parents did not sign the consent form and those with parental, teacher, or researcher's concern about speech, language or cognitive development were excluded from the study. For example, one child from E school was excluded from the study since he had signs of stammering and another from F school that had signs of delayed developmental milestone. This made the researcher to further move to a different school to collect data from two more clients and to retain the target number of clients of 144.

Data collection through assessment involved seeing each child individually and asking them to identify pictures. This made them excited and anxious to share their stories of the pictures identified. On the other hand, the rest who were not given the chance for the exercise due to lack of consent from their parents/ guardians complained why they were not included. They were therefore allowed to identify the pictures for fun but not necessarily to record their speech productions and this left the children fulfilled and excited. A child who had a history of being assessed was exempted from the study since this may be regarded as an indication of a suspicion of a deviation from the norm.

The eight early childhood development centres were both private and slum schools. Most children in Kenya are admitted to their first year in pre-school/ baby class at 3 years of age probably at the beginning of the year.

Below is an illustration of the distribution of clients per age group.

Table 3.2: Distribution of clients per age-group

3:0 -3:5 Yrs	**3:6 -3:11 Yrs**	**4:0 -4:5 Yrs**	**4:6 -4:11 Yrs**	**5:0 -5:5 Yrs**	**5:6-5.11 Yrs**	**Total**
24	24	24	24	24	24	**144**
16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	**100.0%**

All the targeted age groups were represented equally. Among the 24 clients who participated per age group, 12 were boys and 12 were girls as shown in the table below with a total of 144 clients;

Table 3.3: Distribution of clients per age and sex

Age in Years	Girls	Boys
3:0 -3:5	12	**12**
3:6 -3:11	12	**12**
4:0 - 4:5	12	**12**
4:6 -4:11	12	**12**
5:0 - 5:5	12	**12**
5:6 -5:11	12	**12**
Total	**72**	**72**

Each age group represented a six- month period of development.

3.7 Data Collection Procedures

Questionnaires, assessment and audio recording were used to collect data.

3.7.1 Questionnaires

Questionnaires were used to collect information about parental or guardian concern about speech and language development of their children. It also gave information concerning the presence or absence of the child's history of speaking, fluency and hearing impairment compared to age mates. Parents/ guardians were further required to fill in the date, month and year of birth of their child. This helped in the identification of the exact age of the child specifically the year and the month to facilitate in grouping into age level. Children in the EYE within the ages of 3:0 to 5:11 years were given questionnaires (Appendix 11) to carry to their parents/guardians at home. These questionnaires were brought back the following day. Those who forgot to bring back the questionnaires were further reminded to bring the following day and they were anxious to bring back in the next day. A few were anxious to return them the following

day because according to their understanding they believed that the condition of being shown the picture book meant returning the questionnaires.

During analysis of the children's ages, it was interesting to learn that most of the information was different from the information which the class teacher had in the class record. When consulted further, some parents expressed that they had not given the correct age of their children when they were being admitted in school since their kid was below the expected age of admission and this forced them to give a wrong age so that the child is admitted in school. The study therefore opted to use the age given in the filled in questionnaires as opposed to the information in the admission records.

Mowrer's autism theory attempted to explain in terms of learning how children learn speech sounds. The study assumed that the theory meant learning of speech sounds by typical children and this guided in the decision to sample children who are typical. This was done by using a questionnaire to collect information about parental concern about speech and language development of their children. This further gave information concerning the presence or absence of the child's history of speaking, fluency and hearing impairment compared to age mates. This was then to be used in the analysis of acquires speech sounds by typical children.

3.7.2 Assessment and audio recording

Assessment was done using a western based standardized assessment tool, South Tyneside Assessment of Phonology, (STAP) by Armstrong and Ainley (2012). This is the same tool which is currently available and in use by the Association of Speech and Language Therapists in Kenya for assessing acquisition of consonant phonemes. The tool consists of 27 coloured pictures of objects which encourage the child to name each. A sample of the first picture is shown in table 3.4.

Table 3.4: STAP tool: picture 1

Picture one


Those who returned the questionnaires, signed consent forms and met the eligibility criteria (sub-topic 3.6) were assessed individually. This was done in a room with no or less background noise and the researcher created rapport with the child prior to assessment. The client and the researcher sat side by side at a table/desk appropriate for the child's height. The pictures in the booklet were presented one at a time and the child was encouraged to name the items in the picture.

As shown in table 3.5, names of the items to be identified were listed on the phonological sampling/ recording forms under the appropriate picture numbers. The researcher filled in the child's responses by indicating the phoneme realized in the initial, medial and final position. The entire form is shown in appendix 1.

Table 3.5: Sample of phonological sampling/recording form

Client's name ……..		**Age……**			**Assessment date ……**		
PICTURE		Target phonemes and position			Realization and position		
		I	**M**	**F**	**1**	**M**	**F**
1	HOUSE			/s/			
	SUN	/s/					
	SKY	/sk/					
	GRASS		/r/				
	GREEN	/gr/					
	FLOWER	/fl/					
	SMOKE	/sm/					

The assessment was audio recorded using an Apple I phone for completion of transcription after the assessment session. Transcription was done using International Phonetic Alphabet, (IPA). The recordings were saved in a CD and can be availed on request so long as ethical considerations are adhered to. Acceptable realizations were marked with a tick and immature or deviant production was recorded by inserting the incorrect realization against the expected phoneme.

During assessment, there were no picture items presented for the phonemes /θ/and /j/ in initial position. This was because as illustrated on the STAP assessment tool, the two phonemes were to be easily obtained from the child's spontaneous production of 'the' and ' yes' and was to be recorded by the clinician any time during the assessment. By the end of each individual assessment, no child used 'the' and 'yes' spontaneously which forced the assessor to use imitation 'the' and ask an obvious question to the client which could trigger use of the word 'yes'. For example, "Is this your book?" and the client responds spontaneously 'yes'.

In cases where a client produced an alternative name for a picture which still had the target phoneme, it was considered acceptable. For example, jet for rocket, where the target phoneme was /t/ in final position and truck for train where the target phoneme was /tr/ cluster. In cases where a client used an alternative name of a picture in a different language apart from English which had the target phoneme, it was considered acceptable. For example, "basi" for bus yet the target phoneme was /b/ in initial position. In cases where a client used an alternative name of a picture in a different language apart from English which does not have target phoneme, (for example: /kisu/ instead of /knife/) imitation was used. The assessor would name the item/ picture and the client imitated.

For reliability of assessment during data collection, a phoneme was labeled mastered at a particular age level if 90% and above of the clients within an age group correctly produce the target sound, (Sander, 1972). This means three sound elements, initial, medial and final, (IMF) of each phoneme are correctly produced by 90% and above of all clients in an age group. Concerning validity, coloured pictures of objects to be named by the clients were designed to sample single and cluster consonants in STAP. It is a norm referenced standardized tests designed to compare and rank test takers in relation to one another. This makes it possible to compare an individual's score(s) with those of a large group of statistically selected individuals- usually of the same age or grade level – who have already taken the test.

According to Mowrer's autism theory, it is likely that the mother will respond positively to sounds that resemble those she uses, and selectively reinforces these sounds. On the other hand, she will probably not attend to sounds that do not resemble those produced by the community. STAP tool used during assessment had picture items to be named.

The study needed to analyse how sounds are articulated as items are named given that most picture items were familiar to the clients while some were unfamiliar to the children.

3.8 Scoring the Test

Each item named was later sorted in SPSS sheet according to word position. In single consonants a single correct realization resulted in one mark and if a phoneme was realized correctly in the three positions, it resulted in 3 marks. Each correct realization of a cluster consonant resulted in one mark. For example, in table 3.2 there is a total score of 2 out of 3 marks because there are two marks for correct realization of /p/ medial and /p/ final and not /p/ initial.

Table 3.6: Illustration of scoring

Target phoneme	Initial realization	Medial realization	Final realization	**Score**
/p/	/b/	/p/	/p/	2

3.9 Data Coding

Raw data was recorded in SPSS sheet having different ways of coding. To provide anonymity, client's names were written in initials e.g. BM for Boaz Menjo. Sex was coded as 1 for a boy and 2 for a girl. Client's age was also coded according to age category. Clients within the age category of 3:0 -3:5 years were coded as 1, in the age category of 3:6 -3:11years were coded as 2 and those in the age category of 4:0 -4:5 years were coded as 3. Clients within the age category of 4:6 - 4:11 were coded as 4, those within the age category of 5:0 -5:5 years were coded as 5 and finally those within the age category of 5:6 - 5:11 years were coded as 6.

The study identified seven significant phonological processes and all were coded and filled in in the SPSS sheet. Stopping, cluster reduction, epenthesis and depolarization were coded as 1,2,3,4 respectively. Final consonant deletion and devoicing were coded as 5 and 6 respectively.

Each row had the client's name and each column had all single consonant phonemes and clusters, phonological processes involved and marks for each realization made in the different positions. Table 3.5 presents a sample of the recordings in SPSS sheet.

Table 3.7: A sample of SPSS record

Name	Sex	Age	/p/ Initial	Phonological Process	/p/ Medial	Phonological Process	/p/ Final	Phonological Process	Score
KS	1	1	/b/	1	/p/		/p/		2
ML	1	1	/p/						
ST	2	2	/p/						
MI	2	2							

Data was analysed using descriptive survey, One-Way ANOVA and T test. Descriptive survey was used to analyse phonemes realized by 90% and above within an age category. One- Way ANOVA was used to get the mean and standard deviation of phonemes developed per age group since it had six age levels.

3.10 Ethical Considerations

Approval to carry out the study was sought from different institutions which included the National Commission for Science, Technology and Innovation, (NACOSTI), Office of the Regional Coordinator of Education,(RCE), Nairobi region, office of Nairobi County Commissioner, Westlands Sub-County Education office and Dagoretti North Sub-County Education office as shown in appendices 4-7.

After getting permission from the above institutions/ offices, a request letter explaining the purpose of the study and the need of data collection was sent to 8 schools/ EYEC, (Appendix 8). Lastly, all children within the target age bracket in participating institutions were given an explanatory letter (Appendix 10), consent forms (Appendix 9) to be signed by their parents and a questionnaire to be filled in by the parents who accepted to sign the consent form, (Appendix 11).

Parents who needed feedback of the results filled in their telephone numbers in the questionnaire. All records of all clients were kept confidential by the researcher and the parents given feedback after the research was concluded. The institutions whose clients were assessed were given a general feedback of the research; especially the speech development pattern. This can help the parent/ guardian to monitor sounds which have not been mastered by the child in relation to age. Early years education (EYE) teachers will use the results to monitors speech development pattern of boys and girls in class. This can promote early intervention in case there is a delay or disorder in speech development.

Concerning reliability, a phoneme was labelled mastered at a particular age level if 90% and above of the clients within an age group correctly produce the target sound, (Sander, 1972). This means three sound elements, initial, medial and final, (IMF) of each phoneme are correctly produced by 90% and above of all clients in an age group.

3.11 Summary

Using quasi experimental design, clients from each block were randomly selected. Nairobi County was selected since it has clients who speak different first languages and the 144 Clients selected were within the age category of 3:0 -5.11years. Spontaneous speech was used but in cases where a client failed to identify the picture, imitation was

used. All clients assessed were from EYEC except 3 girls and one boy who were assessed in their homes.

Data was collected by using questionnaires, assessment and audio recording. Permission was given by all visited institutions and clients' parents. There was no pilot study carried out in the study.

CHAPTER FOUR

ACQUISITION OF PHONEMES AND PHONOLOGICAL PROCESSES REALIZED

4.1 Introduction

This chapter presents the findings in the study on speech sound acquisition pattern by 144 clients who met the inclusion criteria and whose data was subsequently analysed. All clients were in the ages of 3 to 5 years 11months bracket and were grouped into six age groups. Each group had 24 clients. It starts by presenting the acquisition of consonant phonemes, phonological processes involved and acquisition of consonant phonemes according to sex.

4.2 Acquisition of Consonant Phonemes

Acquisition of single consonant phonemes for each age group is discussed according to the manner of articulation and was assessed from different positions, initial, medial and final, (I, M, F). Cluster consonant phonemes were assessed only in the initial position. The description of their acquisition is grouped into five segments; stops, nasals, fricatives, affricates, laterals and glides.

4.2.1 Stops

The clients within the ages of 3:0 to 3:5 years produced /p/ and /b/ correctly in all positions. Twenty clients produced /t/ correctly in the initial position but two clients who produced the sound as /d/. Only one client produced /t/ as /k/ in the medial position and all produced /t/ correctly in the final position. /d/ was produced correctly by all clients in the initial position but ten clients produced it as /t/ in the final position.

Two clients produced /k/ as /g/ in initial position, twenty four clients produced it correctly in the medial position and three clients deleted it in the final position. Only

one client realized /g/ as /d/ in the initial position, twenty four clients realized the sound correctly in the medial position and only one realized the sound as /d/ in final position.

Below is an illustration in percentage of how each phoneme was acquired by age group. The summary finally shows which phoneme is considered to be mastered by the age level.

Table 4.1: Acquisition of stops at 3:0 to 3:5 years

		Acquisition in %			
Phoneme No:	**Target Phoneme**	**I**	**M**	**F**	**Average**
1	/p/	100	100	96	**99**
2	/b/	100	100	100	**100**
3	/t/	92	96	100	**96**
4	/d/	100	100	58	**86**
5	/k/	92	100	79	**90**
6	/g/	96	100	96	**97**

I: Initial position **M**: Medial position **F**: Final position

A phoneme is labelled mastered at a particular age level if 90% and above of the subjects within an age group correctly produce the target sound (Sander, 1972). This means three sound elements (I, M, F) of each phoneme are correctly produced by 90% and above of all clients in an age group. From the above table, twenty four clients in the age group were able to get an average of 90% and above except /d/ which was 86%. This indicates that all stops are developed in this age group except /d/.

In the category of 3:6 to 3:11years, twenty four clients produced /p/ correctly in all positions. Twenty four clients produced /b/ correctly in all positions except one client who realized it a /p/ in the initial position and one client who produced it as silent in the final positions.

In the initial position, /t/ was realized as /d/ by three clients and one client deleted the phoneme. Three clients realized /t/ as /d/ in the medial position and only realized it as /s/ in the final position. In the initial position, one client realized /k/ as /g/ and one client realized it as silent but twenty four clients realized /k/ correctly in the medial position. In the final position, three clients realized /k/ as /g/, one client as /s/ and two clients realized the sound as silent. /g/ was realized correctly by all clients in the initial position, only one client realized it as /k/ in medial position and twenty four clients realized it correctly in the final position. From the illustrations in table 4.2, only /d/ and /k/ had an average of less than 90%. This indicates that they are the only stops not mastered in this age group, the rest (/p, b, t, g/) are mastered. The study noted that though /k/ appears not mastered in this age category, it appeared mastered in the age category of 3:0 -3:5 years and this is considered to be an indication of regression. The study therefore considered /k/ to be mastered at the first age when it appeared mastered up to the last age when it re-appeared mastered, which is 3:0 -4:5.

Table 4.2: Acquisition of stops at 3:6 to 3:11years

		Acquisition in %			
Phoneme No.	**Target Phoneme**	**I**	**M**	**F**	**Average**
1	/p/	100	100	100	**100**
2	/b/	96	100	96	**97**
3	/t/	96	100	96	**97**
4	/d/	79	92	96	**89**
5	/k/	90	100	75	**88**
6	/g/	100	96	100	**99**

The clients within the ages of 4:0 to 4:5 years produced /p/ and /b/ correctly in all positions, /t/ was produced correctly in all positions except in the final position where one client produced it as /d/. In the initial and medial positions, /d/ was produced

correctly but one client produced it as /t/ in the final position. /k/ and /g/ were produced correctly by 92% and above of the clients in all positions.

Table 4.3: Acquisition of stops in the age of 4:0 to 4:5 years

		Acquisition in %			
Phoneme No:	**Target Phoneme**	**I**	**M**	**F**	**Average**
1	/p/	100	100	100	**100**
2	/b/	100	100	96	**99**
3	/t/	100	100	96	**99**
4	/d/	100	100	96	**99**
5	/k/	96	100	96	**97**
6	/g/	100	92	100	**97**

The above summary indicates that /p, b, t, d, k & g/ are all developed since they have been realized at a score of 90% or more by the clients.

The clients within the ages of 4:6 to 4:11 years realized /p/ and /b/ correctly in all positions. /t/ was realized correctly in all positions except by one client who realized the sound as /d/ in the initial and medial positions. /d/ was realized correctly in all positions except by one client who realized it as /z/ in the initial position and the same client realized it as /t/ in the final position. /k/ was realized correctly in the initial and medial positions but one client realized it as silent in the final position. /g/ was realized correctly in the initial and final positions but one client realized it as /k/ in the medial position.

Table 4.4: Acquisition of stops in the ages of 4:6 to 4:11 years

Phoneme No:	Target phoneme	Acquisition in %			
		I	**M**	**F**	**A**
1	/p/	100	100	100	**100**
2	/b/	100	100	100	**100**
3	/t/	96	96	100	**97**
4	/d/	96	100	96	**97**
5	/k/	100	100	96	**99**
6	/g/	100	83	100	**94**

In the category of 5:0 to 5:5 years, /p/ was produced correctly by twenty four clients in all positions but /b/ was realized by one client as /p/ in the initial position. /t/ was realized by one client as /d/ in the initial position and as /s/ in medial position but was correctly produced in the final position. In initial position, /d/ was produced correctly by all clients but in the medial position, one client produced it as /t/ and in the final position two clients realized it as /t/. /k/ was produced correctly in both the initial and medial positions but in the final position, one client did not produce the phoneme. /g/ was produced correctly in the initial and final positions but in medial position, two clients produced it as /k/.

Table 4.5: Acquisition of stops by 5:0 to 5:5 year old clients

Phoneme No.	Target phoneme	Acquisition in %			
		1	**M**	**F**	**Average**
1	**/p/**	100	100	100	**100**
2	**/b/**	96	100	100	**99**
3	**/t/**	96	96	100	**97**
4	**/d/**	100	96	92	**96**
5	**/k/**	100	100	96	**99**
6	**/g/**	100	90	100	**97**

In the last age group 5:5 to 5:11years, twenty four clients realized /p/ and /b/ correctly in all positions. Two clients realized /t/ as /d/ in the initial position and one client realized it as /d/ in the final position. /d/ was realized correctly in the initial and final positions but three clients realized it as /t/ in the medial position. /k/ was realized correctly in all positions except one client who realized it as /g/ in the final position. One client realized /g/ as /k/ in the initial position and in final position.

Table 4.6: Acquisition of stops in the ages of 5:5 to 5:11 years

Phoneme No.	**Target phoneme**	**Acquisition in %**			
		I	**M**	**F**	**Average**
1	/p/	100	100	100	**100**
2	/b/	100	100	100	**100**
3	/t/	92	100	96	**96**
4	/d/	100	90	100	**97**
5	/k/	100	100	96	**99**
6	/g/	96	96	100	**97**

Table 4.6 showed that twenty four clients produced /p/ correctly in all positions in all age groups. In the age category of 5:0 -5:5 years, all stops were produced correctly by a score of 90% or more in all positions by twenty four clients.

4.2.2 Nasals

In the age category 3:0 to 3:5 years, twenty four clients realized /m/ correctly in the initial position, one client realized it as /s/ in the medial position and one realized it as /b/ in the final position. In the initial and medial positions, one client realized /n/ as /m/ and /l/ respectively. In the final position one client did not realize /n/ and another client realized it as /m/. Four clients realized /ŋ/ as /n/ in the medial position and in the final position, 11 clients realized the sound as either/n, /ŋk/or silent.

Table 4.7: Acquisition of nasals in the ages of 3:0 to 3:5 years

Phoneme No:	Target Phoneme	Acquisition of in %			
		I	**M**	**F**	**Average**
7	/m/	100	96	96	97
8	/n/	96	96	92	94
9	/ŋ/		71	58	64

Apart from /m/ and /n/, /ŋ/ was realized correctly by less than 90% of the clients. This means by the age category of 3:0 to 3:5 years, the velar nasal /ŋ/ has not developed.

Clients in the ages of 3:6 to 3:11years realized /m/ correctly in both the initial and final positions but two clients produced the sound as /f/ in the medial position. In the initial position /n/ was produced as /d/ by one client and /l/ by two clients. In the medial position, /n/ is realized as /d/ by one client and /m/ by one client. In the final position, three clients produced it as silent and one client realized as /m/.

Table 4.8: Acquisition of nasals by 3:6 to 3:11 year old clients

Phoneme No:	Target Phoneme	Acquisition in %			
		I	**M**	**F**	**Average**
7	/m/	100	92	100	**97**
8	/n/	83	92	83	**86**
9	/ŋ/		50	50	**50**

Only /m/ is mastered in this age group since it is realized correctly by more than 90% of the clients. Though /n/ had been realized correctly by clients in the age bracket of 3:5 to 3:11 years, clients in the age bracket of 3:3 -3:11 have not mastered the sound.

In the category of 4:0 to 4:5years, all clients realized /m/ and /n/correctly in all positions.

Table 4.9: Acquisition of nasals by 4:0 to 4:5 year old clients

Cluster No.	Target Phoneme	Acquisition in %			
		I	**M**	**F**	**A**
7	/m/	100	100	100	**100**
8	/n/	100	100	100	**100**
9	/ŋ/		87	83	**85**

As shown in table 4.9, /m/ and /n/ are developed in this age group but /ŋ/ is not yet developed.

Clients in the age bracket of 4:6 to 4:11 years produced /m/ and /n/ correctly in all positions. Two clients produced /ŋ/ as /ŋk/ in the medial position and two clients produced it as /n/ in the final position.

Table 4.10: Acquisition of nasals by 4:6 to 4:11 year old clients

Phoneme No:	Target phoneme	Acquisition in %			
		I	**M**	**F**	**Average**
7	/m/	100	100	100	**100**
8	/n/	100	100	100	**100**
9	/ŋ/		92	87	**90**

In the age category of 5:0 to 5:5 years, /m/ was realized correctly by twenty four clients in all positions and /n/ was realized correctly by twenty four clients in initial and medial positions. In the final position, /n/ was not realized by one client and two clients realized it as /ɲ/. Twenty four clients realized /ŋ/ correctly in the medial position. In the final position, one client realized it as /n/ and two clients realized it as /ŋk/. Twenty four clients in this age group have developed all the nasals since all have ≤ 90% of the clients have realized the nasals correctly.

Table 4.11: Acquisition of nasals by 5:0 to 5:5 year old clients

Phoneme no.	Target phoneme	Acquisition in %			
		1	**M**	**F**	**A**
7	**/m/**	100	100	100	**100**
8	**/n/**	100	100	87	**96**
9	**/ŋ/**		100	87	**94**

In the age category of 5:6 to 5:11years, twenty four clients produced /m/ correctly both in the initial position and in the final position. Only one client produced /m/ as /n/ in the medial position. Twenty four clients produced /n/ correctly in all positions but two clients produced /ŋ/ as /n/ in the medial position and two clients produced the same in the final position. Table 4.12 showed that /m/ and /n/ were produced correctly by a score of 90% and more and this indicates that the two sounds are developed. /ŋ/ is not yet developed since it was produced correctly by a score of less than 90%

Table 4.12: Acquisition of nasals by 5:6 to 5:11 year old clients

Phoneme no.	Target phoneme	Acquisition in %			
		I	**M**	**F**	**Average**
7	/m/	100	92	100	**97**
8	/n/	100	100	100	**100**
9	/ŋ/		83	92	**87**

4.2.3 Fricatives

Twenty four clients within the ages of 3:0 to 3:5 years realized /f/ correctly in the medial and final positions. Only in the initial position was /f/ realized as /s/ by one client. In the initial position, /v/ was realized as /b/ by two clients, /f/ by one client and the rests

realized it correctly. In the medial position, /v/ was realized as /p/ by two clients and as silent by one client. In the final position, /v/ was realized as /f, b, s/ by one client each while the rest realized it correctly. Only two clients realized /θ/correctly in the initial position and the rest of the clients realized the sound as /d, z, f, l, s/. In the medial position, only six clients realized /θ/correctly but the rest of the clients realized the sound as /d, t, f, s, z/. In the final position the same fricative was realized correctly by only five clients and the rest realized the sound as /t, d, s/ and as silent. In the initial position, eight clients realized /ð/correctly but the rest realized the sound as/ d, f, z, t/. In the medial position, only ten clients were able to realize the sound correctly. In the final position, only two clients were able to realize the sound correctly but the rest realized as /t, p, s, k/ and as silent. Only five clients realized /s/ as /θ/in the initial position but the rest produced the sound correctly. In the medial position, twenty four clients produced the sound correctly except one client who produced it as /ʧ/. In the final position, only two clients realized the sound as /ʧ/ and /θ/ but the rest produced it correctly. /z/ was produced by four clients and it was produced as /ʧ, ʃ, θ/ in the initial position and produced by three clients as /s/ and /ʧ/and in the final position. Only one client realized the sound as /z/. /ʃ/ was realized as /s/ by eight clients in the initial position and as /s/ in the medial position by eight clients again and in the final position the same sound was produced as /s/ by nine clients. /ʒ/ being in the medial position only, two clients produced the sound correctly but the rest produced the sound as /s, z, ʃ, ʧ, θ. /h/ was produced correctly by fourteen clients and the rest deleted the phoneme during realization. Only one fricative (f) is mastered in this age group.

Any realization which was contrary to the target phoneme but considered by the researcher to be caused by accent was not considered as wrong. For example, /r/ and /l/

for those whose native language is kikuyu and /s/ and /ʃ/ for those whose native language is Luo.

Table 4.13: Acquisition of fricatives by 3:0 to 3:5 year old clients

		Acquisition of in %			
Phoneme No:	**Target Phoneme**	**I**	**M**	**F**	**Average**
10	/f/	96	100	100	**99**
11	/v/	87	91	87	**88**
12	/θ/	8	30	8	**15**
13	/ð/	34	41	13	**29**
14	/s/	79	96	92	**89**
15	/z/	83	87	92	**87**
16	/ʃ/	63	68	63	**64**
17	/ʒ/		4		**4**
24	/h/	58			**58**

In the second age group (3:6 to 3:11 years), /f/ was produced correctly by twenty four clients in the initial and medial positions. Only one client realized /f/ as /p/ in the final position. Three clients produced /p, b / in the initial position but twenty four clients realized the sound correctly in the medial position and four clients produced the sound as /f, p/ and silent in the final position. Thirteen of the clients realized /θ/ as /f, d, s, z t/, in the medial position, eighteen clients produced /θ/ as /d, t, s/ and 16 clients produced the sound as /d, t, s/ in the final position. Sixteen produced /ð/ as /f, d, z/ in the initial position. In the medial position sixteen clients produced the sound as /d, z, t, s/ and in the final position, seventeen clients produced the sound as /t, s, z/. /s/ was produced as /ʃ/ in the initial position but was produced correctly by all clients in the medial and final positions. /z/ was produced correctly by eighteen clients in the initial position and the rest produced the sound as /s/. In medial position, only four clients produced /z/ as /s/, /ʧ/, /θ/ while the rest produced the sound correctly. In the final position, /z/ was realized

correctly by all clients except one who realized it as /s/. /ʃ/ was realized as /s/ by ten clients in the initial position and five clients in the medial position. In the final position, it was produced as /s/ by eight clients. Fourteen clients produced /ʒ/ as /s, z, ʧ, θ/. Nineteen clients realized /h/ correctly but five realized it as silent. By the age of 3.11, the only two fricatives with an average of 90% and above are /f/ and /s/. This indicates that only two fricatives are mastered by this age.

Table 4.14: Acquisition of fricatives by 3:6 to 3:11 year old clients

		Acquisition in %			
Phoneme No.	**Target Phoneme**	**I**	**M**	**F**	**Average**
10	/f/	96	100	96	**97**
11	/v/	87	96	83	**89**
12	/θ/	46	4	34	**28**
13	/ð/	5	34	34	**24**
14	/s/	96	96	100	**97**
15	/z/	75	79	96	**83**
16	/ʃ/	58	79	58	**65**
17	/ʒ/		29		**29**
24	/h	79			**79**

In the age category of 4:0 to 4:5 years, /f/ and /v/ were produced correctly by twenty four clients in all positions. /θ/ was produced as /s, t, d, f/ in the initial position by nine clients and was produced as /f, t, s, d, z/ by ten clients in medial position. In the final position eight clients realized the sound as /d, s, t, z/. Six clients realized /ð/ as /t, d, s, f, z / in the initial position, eleven clients produced the sound as /d, s, z/ in the medial position and in the final position, nine clients realized the sound as /d, s, z/. Twenty four clients realized /s/ sound correctly in all positions. /z/ was produced as /s/ and θ/ by four clients in the initial position and by three clients in medial position. In the final position, /z/ was realized as/s/ and /θ/ by six clients. In the initial position, /ʃ/ was produced as

/s/ by eleven clients and four clients realized the sound as /s/ in medial position and in the final position, only two clients produced the sound as /s/ and /θ/ and the rest realized the sound correctly. /ʒ/ was realized as /s, z, ʃ/ by ten clients and the rest realized the sound correctly. Only four clients realized /h/ as silent and the rest produced the phoneme correctly.

Table 4.15: Acquisition of fricatives by 4:0 to 4:5 year old clients

		Acquisition in %			
Phoneme No.	**Target Phoneme**	**I**	**M**	**F**	**Average**
10	/f/	100	100	100	**100**
11	/v/	100	100	71	**90**
12	/θ/	62	58	67	**46**
13	/ ð/	75	54	62	**64**
14	/s/	100	100	100	**100**
15	/z/	83	87	75	**82**
16	/ʃ/	50	83	75	**69**
17	/ʒ/		58		**58**
24	/h/	83			**83**

Twenty four clients in the category of 4:6 to 4:11 years realized /f/ correctly in all positions except one client who realized it as /p/ in the initial position. Twenty four clients realized /v/ correctly in all positions except in the middle position where three clients realized the sound as /s/ and as silent. Fourteen clients realized /θ/ correctly in the initial position but the rest realized the phoneme as /z, s & d/ in the medial position, eleven clients realized the sound correctly and the other clients realized the phoneme as /s, f, z, t/. In final position, fifteen clients realized the phoneme correctly but the remaining clients realized the phoneme as /t, s, & b/. /ð/ was produced correctly by fifteen clients in the initial position but the rest produced the phoneme as /z, p, s, t, d,

f/. Thirteen clients realized the phoneme correctly in medial position and the rest realized as /t, d, s, and b/. Fifteen clients produced the phoneme correctly but the rest of the clients produced the phoneme as /t, s, b, and d/. Twenty four clients produced /s/ correctly in both the initial and medial positions but only one produced it as /t/ in the final position. Twenty one clients realized /z/ correctly in the initial position while the rest realized the same phoneme as /s/ and /θ/. The same number of clients realized /z/ in the medial position correctly and the rest realized the phoneme as /s/. In the final position twenty clients realized the phoneme correctly and the remaining clients realized it as /s/ and /θ/. Two clients in initial, medial and final positions realized /ʃ/ as /s/. Seventeen clients realized /ʒ/ correctly and the rest realized it as / s, z and ʧ/.

Table 4.16: Acquisition of fricatives by 4:6 to 4:11 year old clients

		Acquisition in %			
Phoneme No:	**Target Phoneme**	**I**	**M**	**F**	**Average**
10	/f/	96	100	100	**99**
11	/v/	100	87	96	**94**
12	/θ/	50	50	58	**50**
13	/ ð/	62	54	62	**60**
14	/s/	100	100	96	**99**
15	/z/	87	87	79	**85**
16	/ʃ/	87	92	92	**90**
17	/ʒ/		58		**58**
24	/h/	75			**75**

Twenty four clients within the age group of 5:0 to 5:5 years produced /f/ correctly in all positions. Only in the initial position was /v/ realized correctly by twenty four clients. In the medial position, five clients produced it as /v/ and in the final position, six clients realized the phoneme as /b/ and one client produced the phoneme as silent. Twelve clients realized /θ/ correctly in the initial position and the rest produced the phoneme as

/z, s, d, t, and f/. Thirteen clients produced the same sound in medial position correctly and the rest realized it as /z, d, t, f, k and d/. In the final position, eleven clients produced the sound correctly and the rest realized it as /s, t and d/. Thirteen clients produced /ð/ correctly in the initial position and the rest produced as /s, z, t, d and f/. In medial position, thirteen clients realized the phoneme correctly but the rest realized it as /d, z and t/. Twenty four clients realized /s/ correctly in all positions. Twenty four clients realized /z/ correctly in the initial position except one who realized the phoneme as /s/. Only three clients realized /z/ as /s/ in the medial position and in the final position only two realized the sound as /s/. The rest of the clients produced the sound correctly. /ʃ/ was realized as /s/ by four clients in the initial position, one client in the medial position and two clients in the final position. The rest of the clients produced the phoneme correctly. Fourteen clients produced /ʒ/ correctly while the rest produced the phoneme as /z, s/. Twenty two clients realized /h/ correctly and the remaining two clients realized /h/ as silent.

Table 4.17: Acquisition of fricatives at the age of 5:0 to 5:5 years

Phoneme no.	Target phoneme	Acquisition in %			
		1	**M**	**F**	**Average**
10	**/f/**	100	100	100	**100**
11	**/v/**	100	79	71	**83**
12	**/Ɵ/**	50	54	50	**33**
13	**/ð/**	54	54	54	**54**
14	**/s/**	100	100	100	**100**
15	**/z/**	96	87	92	**92**
16	**/ʃ/**	83	96	87	**89**
17	**/ʒ/**		58		**58**
24	**/h/**	92			**92**

Twenty four clients within the ages of 5:6 to 5.11 years realized /f/ correctly in all positions. /v/ was realized correctly by all clients in the initial position, one client realized it as /θ/ in medial position, and three clients realized the sound as /p/ and /b/ in the final position. Seventeen clients realized /θ/ correctly in the initial position and the rest realized the phoneme as /s, z and d/. Eighteen clients realized the phoneme correctly in the medial position but the rest realized it as /s, d, f, t and z/. In the final position, seventeen clients realized the phoneme correctly and the rest realized the sound as /z, s, t/. /ð/ was realized correctly by nineteen clients in the initial position and the other clients realized the phoneme as /z, t and f/. In the medial position, twenty clients realized the sound correctly but the rest realized the phoneme as /z, d and s/. In the final position, eighteen clients realized the sound correctly but the rest realized it as /n, t and s/. All clients realized the sound /s/ correctly in all positions. Twenty one clients produced /z/ correctly in the initial position but the rest produced it as /ʘ/ and /s/. In the medial position, eighteen clients realized the phoneme correctly but the rest produced the sound as /s/ and all clients realized the phoneme correctly in the final position. Only ten clients realized /ʒ/ correctly while the rest of the clients produced the phoneme as /s, z, ʃ, ʧ/. Twenty clients realized /h/ correctly and the rest realized the sound as silent.

Table 4.18: Acquisition of fricatives by 5:6 to 5:11 year old clients

Phoneme no.	Target Phoneme	Acquisition in %			
		I	**M**	**F**	**Average**
10	/f/	100	100	100	**100**
11	/v/	100	96	87	**94**
12	/Ɵ/	71	75	71	**72**
13	/ ð/	79	83	71	**78**
14	/s/	100	100	100	**100**
15	/z/	87	75	100	**87**
16	/ʃ/	71	87	87	**82**
17	/ ʒ/		41		**41**
24	/h/	79			**79**

By the age of 5:11 years, only three fricatives (f, v, s) are mastered and the rest (/θ, ð, z, ʒ & h/) are realized correctly by less than 90% of the clients.

At the age category of 5:6 to 5.11 years, /h/ is not mastered yet it was mastered within the age category of 5:0 -5:5 years. It was also noted that /ʃ/ is not mastered at the age category of 5:6 to 5:11 yet it was mastered by clients in the age category of 5:0 to 5:5years. The study considered this as an indication of regression.

4.2.4 Affricates

Twenty four clients within the ages of 3:0 to 3:5 years produced /ʧ/ correctly in the initial position except one client who produced it as /ʃ/. No client produced /ʤ/ correctly in all the positions. In the initial position all the clients produced /ʤ/ as /ʧ/. In the medial and final positions, the phoneme was produced as /ʧ/ and it was silent.

Table 4.19: Acquisition of affricates at the age of 3:0 to 3:5 years

Phoneme No:	Target Phoneme	Acquisition in %			Average
		I	M	F	
18	/ʧ/	96	96	91	**92**
19	/ʤ/	0	0	0	**0**

Twenty four clients within the ages of 3:6 to 3:11 years realized /ʧ/ correctly in all positions. Ten clients realized /ʤ/ as /ʧ/ in the initial position and nine clients realized the sound as /ʧ/ in the medial position and nine clients realized it as /ʧ/ and /s/ in the final position.

Table 4.20: Acquisition of affricates at the age of 3:6 to 3:11 years

Phoneme no.	Target Phoneme	Acquisition in %			
		I	M	F	Average
18	/ʧ/	100	96	97	**97**
19	/ʤ/	4	58	67	**43**

Within the age group of 4:0 to 4:5 years, twenty four clients produced /ʧ/ correctly in all positions. Twenty four clients produced /ʤ/ correctly in the initial position except two clients who produced it as /ʧ/. Twenty four clients produced the sound correctly in the medial and final positions.

Table 4.21: Acquisition of affricates at the age of 4:0 to 4:5 years

Phoneme No.	Target Phoneme	Acquisition in %			
		I	M	F	Average
18	/ʧ/	100	100	96	**99**
19	/ʤ/	58	71	87	**53**

In the age category of 4:6 to 4:11 years, /ʧ/ was realized correctly by twenty four clients in all positions. Three clients realized /ʤ/ as /ʧ/ in the initial position and five clients realized it as/ʧ/ in the medial position. In final position, /ʤ/ was realized as /ʧ/.

Table 4.22: Acquisition of affricates at the age of 4:6 to 4:11 years

Phoneme No:	**Target phoneme**	**Acquisition in %**			
		I	**M**	**F**	**A**
18	/ʧ/	100	100	100	**100**
19	/ʤ/	0	79	92	**57**

Twenty four clients within the ages of 5 to 5:5 years produced /ʧ/ correctly in all positions. Six clients produced /ʤ/ as /ʧ/ in the initial position and another three clients produced it /ʧ/ in the medial position. In the final position, six clients produced the sound as /ʧ/ and the rest produced it correctly.

Table 4.23: Acquisition of affricates at the age of 5:0 to 5:5 years

Phoneme no.	**Target phoneme**	**Acquisition in %**			
18	**/ ʧ/**	**98**	**100**	**100**	**99**
19	**/ ʤ/**	**0**	**87**	**75**	**54**

In Table 4.24, twenty four clients realized /ʧ/ correctly in all positions. Five clients realized /ʤ/ as /ʧ/ in both the initial and medial positions while three clients realized the sound as/ʧ/ in the final position.

Table 4.24: Acquisition of affricates at the age of 5:6 to 5:11 years

Phoneme no.	**Target phoneme**	**Acquisition in %**			**Average**
		I	M	F	
18	/ʧ/	100	100	100	**100**
19	/ʤ/	0	79	87	**56**

4.2.5 Laterals

Twenty four clients in the study produced /l/ correctly in the initial position. In the medial position, all clients produced /l/ correctly except one client in the age category of 3:6-3:11 who omitted the sound. In the final position, all clients produced l/ correctly except two clients who omitted the sound in the age category of 3:0 -3:5, one client in the age categories of 4:6 -4:11 and 5:6 -5:11. Below is an illustration of the same.

Table 4.25: Acquisition of /l/ by clients in all age categories

Age Category	Phoneme	Acquisition in %			Average
		I	**M**	**F**	
		100	100	92	**97**
3:6 -3:11	/l/	100	96	100	**99**
4:0 -4:5	/l/	100	100	100	**100**
4:6 -4:11	/l/	100	100	96	**99**
5:0 -5:5	**/l/**	100	100	100	**100**
5:6 -5:11	/l/	100	100	96	**99**

Twenty four clients in the study realized /r/ correctly in the initial position except seven clients in the age category of 3:0 -3:5 and two clients in the age category of 3:6 -3:11 who realized the phoneme as silent In the medial position, only one client in the age category of 3:0 – 3:5 years omitted /r/ during production but the rest realized it correctly.

Table 4.26: Acquisition of /r/ by clients in all age categories

Age category	Target Phoneme	Acquisition in %			
		I	**M**	**F**	**A**
3:0 -3:5	/r/	71	96		**83**
3:6 -3:11	/r/	87	100		**94**
4:0 -4:5	/r/	100	100		**100**
4:6 –4:11	/r/	100	100		
5:0 -5:5	**/r/**	100	100		**100**
5:6 – 5:11	/r/	100	100		**100**

In the initial position, /r/ was produced correctly by less than 90% of the clients between the age categories of 3:0 -3.11 years. This means the sound is not yet developed by this age. In the age category of 4:0 -5.11 years all clients produced /r/ correctly in the initial position. This means that by the age of 3 years, /r/ is developed in the medial position. This is illustrated in the table above. All the sounds produced wrongly were through omission.

4.2.6 Glides

Twenty four clients in the study realized /w/ correctly in all positions as illustrated in the table below.

Table 4.27: Acquisition of w/ by clients in all age categories

		Acquisition in %			
Age category	**Phoneme**	**I**	**M**	**F**	**Average**
3:0 -3:5	/w/	100	100		**100**
3:6 -3:11	/w/	100	100		**100**
4:0 -4:5	/w/	100	100		**100**
4:6 – 4:11	/w/	100	100		**100**
5:0 -5:5	**/w/**	100	100		**100**
5:6 -5:11	/w/	100	100		**100**

One client from the age category of 3:0 -3:5 and 3:6-3:11years omitted /j/ in initial position while the rest of the clients realized it correctly. In the medial position, fifteen clients omitted /j/ during realization. Twenty four clients in all age categories realized the phoneme correctly in the final position. This is illustrated in the table below:

Table 4.28: Acquisition of glides at the age of 3:6 to 5:11 years

		Acquisition in %			
Phoneme no.	**Target Phoneme**	**I**	**M**	**F**	**Average**
3:0 -3:5	/j/	96	79	100	**92**
3:6 -3:11	/j/	96	75	100	**90**
4:0 -4:5	/j/	100	96	100	**99**
4:6 -4:11	/j/	100	92	100	**97**
5:0 – 5:5	/j/	100	100	100	**100**
5:6 -5:11	/j/	100	92	100	**97**

All glides are developed by the age of 3:0 to 3:5 years.

4.2.7 Acquisition of cluster consonant phonemes

The researcher intended to assess 20 consonant clusters as stipulated in the STAP assessment tool. Unfortunately, /br/ was not assessed due to an error during recording. The study therefore did not give any report on the age at which /br/ is mastered. This led to assessment of only 19 consonant clusters. The realizations made by twenty four clients in all age groups are illustrated in appendix 7 to 12. Table 4.29 gives a presentation of the clusters by age group.

Table 4.29: Acquisition of clusters per age group

No	clusters	3:0-3:5	3:6-3:11	4:0-4:5	4.6-4.11	5:0-5.5	5.6-5.11
1	/pl/	67	75	100	92	100	100
2	/pr/	46	75	96	87	100	100
3	/bl/	67	75	92	100	96	100
4	/tr/	34	41	83	67	75	92
5	/dr/	54	71	87	83	100	100
6	/kl/	38	58	87	96	100	96
7	/kr/	50	71	100	92	96	100
8	/gl/	50	50	87	79	87	83
9	/gr/	50	41	87	79	96	96
10	/fl/	79	75	96	96	100	100
11	/fr/	63	75	96	87	96	100
12	/θr/	13	17	34	34	34	67
13	/sp/	58	83	87	96	100	100
14	/st/	75	75	87	96	92	96
15	/sk/	67	71	96	100	100	100
16	/sm/	54	71	92	100	96	100
17	/sn/	62	83	96	96	100	96
18	/sw/	92	96	96	92	100	100
19	/sl/	34	54	96	92	100	92

From the above table, consonant clusters produced correctly by 50% and above of the clients are /pl/, /bl/, /dr/, /kr/, /gl/, /gr/, /fl/, /fr/, /sp/, /st/, /sk/, /sm/, /sn/ and /sw/. Consonant clusters produced correctly by less than 50% of the clients are /pr, /tr/, /kl/, /θr/ and /sl/ were produced by less than 50% of the clients. The only cluster that was correctly produced by 90% and more of the clients was /sw/ indicating that it is the onl one mastered by the age group.

In the age category of 3:6 -3:11 years, consonant clusters realized by 50% and above of the clients are: /pl/, /pr, /bl/, /dr/, /kl/, /kr/, /gl/, /fl/, /fr/, /sp/, /st/, /sk/, /sm/, /sn/, /sw/ and /sl/. /tr/, /gr/ and /θr/ were realized correctly by less than 50 % of the clients. The only cluster consonant developed in this age group was /sw/ since it was realized correctly by an average score of 90% and more of the clients and the rest were realized correctly by a score of less than 90%. Among the clients in the age category of 4:0 to 4:5 years, eleven consonant clusters were realized correctly by 90% and above. These were: /pl/, /pr/, /bl/, /kr/, /fl/, /fr/, /sk/, /sm/, /sw/, /sn/ and /sl/. Only /θr/ was realized correctly by only 37 % of the clients. In the age group of 4:6 to 4:11 years, twelve consonant clusters were realized correctly by an average score of 90% and more of the clients, these are: /pl, bl, kr, kl, fl, sp, st, sk, sm, sn, sw and sl/. / θr/ was realized by 37% like the earlier age group.

Clients in age category of 5:0 to 5:5 years produced consonant clusters correctly by an average score of 90% and more. These are: /pl/, /pr, /bl/, /dr/, /kl/, /kr/, /gr, /fl/, /fr/, /sp/, /st/, /sk/, /sm/, /sn/, /sw/ and /sl/. In the last age group of 5.5 to 5.11 years, all consonant clusters assessed were produced correctly by and average score of 90% and more of the clients except /gl/ and /θr/ which were realized correctly by twenty and 16 clients respectively.

It was noted that two consonant clusters; /pr/ and /fr/ were realized correctly by 96% of clients in the age category of 4:0 -4:5 years which indicates that they are mastered. The same clusters in the age category of 4:6 -4:11 years are realized by less than 90% of the clients. The study considered this as an indication of a regression. The study considered the two clusters to be mastered at the age category of 4:0 -4:5 years since both sexes reached a minimum score of 90%. In cases where an SLP assesses a client who is above

the age of 4:5 years who has not mastered these two sounds, gender should be taken into consideration. This is further explained in sub topic 4.4 on consonant phonemes according to sex.

The study found that more consonant clusters are produced correctly with advancement of age. It was also noted that apart from /sw/ which was produced correctly by clients within the ages of 3:0 -3:5years, correct realization of consonant clusters starts from the age of 4 years.

4.2.8 A summary of consonant phonemes mastered by all age groups

A phoneme was labelled mastered at a particular age level if a 90% and above of the clients within an age group correctly produce the target sound. This meant an average of the three sound elements (I, M, F) of each phoneme is ≤90% of all children in an age group.

Below is a summary of consonant phonemes realized correctly/mastered by≤ 90% of the clients per age group.

Table 4.30: Single and cluster consonant phonemes mastered

Age group	Single consonants	Consonant clusters
3:0 – 3:5	/p, b, t, k, g, m, n, f, ʧ, l, w, j/	**/sw/**
3:6 -3:11	/p, b, d, g, m, f, s, ʧ, l, **r**, w, j/	**/sw/**
4:0 -4:5	/p, d, t, d, k, g, m, n, f, **v**, ʧ, s, l, r, w, j/	**/pl, pr, bl, kr, fl, fr, sk, sm, sn, sw, sl/**
4:6 -4.11	/p, b, t, d, k, g, m, n, ŋ, f, v, s, ʃ, ʧ, l, r, w, j/	**/pl, bl, kl, kr, fl, sp, st, sk, sm, sn, sw, sl/**
5:0 -5:5	/p, b, t, d, k, g, m, n, ŋ, f, s, z, ʃ, ʧ, l, r, w, j, h/	**/pl, pr, bl, dr, kl, kr, gr, fl, fr, sp, st, sk, sm, sn, sw, sl/**
5:6 -5:11	/p, b, t, d, k, g, m, n, f, v, s, ʧ, l, r, w, j/	**/pl, pr, bl, tr, dr, kl, kr, gr, fl, fr, sp, st, sk, sm, sn, sw, sl/**

By using descriptive statistics to analyse realizations in six monthly age bands, a gradual progression of speech accuracy is realized. This study concurs with Dodd et al. (2003) that as children get older, their speech becomes more accurate, more sounds are articulated correctly and few error patterns are realized.

As seen in the illustration above, there were 12 single consonants and one cluster phonemes (/sw/) had been mastered in the first age group and the number of increased with advancement of age. By the age of 5.11, four single consonant phonemes (/θ/, /ð/, /ʒ/ & ʤ/) and two cluster consonant phonemes (/θr, gl /) had not been mastered. None of the age group realized /θ/, /ð/, and /ʒ/ and /ʤ/ by ≤90%. This does not concur with Prather, Hedrick, and Kern (1975) and Dodd et al. (2003) who found out that /ʒ/ is acquired by 4 years.

4.3 Phonological Processes

When children imitate adults as they develop speech, they use typical pattern of errors called phonological processes, (Pena-Books & Hedge, 2007). During the study there were phonological processes realized by clients. The processes identified were: stopping, initial and final consonant deletion, prevocalic voicing, devoicing, depalatization, unstressed consonant deletion, epenthesis and devoicing. Below is a breakdown of each process.

4.3.1 Stopping

Stopping is when a fricative is replaced by a stop. In the study, sixty clients within the age category of 3:0 -3:5 years produced stops instead of fricatives. These realizations were made in the initial, medial and final positions. In the initial position, /θ/ was produced as /d/. For example, dam /dʌm/ for thumb /θʌm/. In the final position, they realized /t/ instead of /θ/. For example, mout /məʊt/ for mouth /məʊθ/. The other age

categories within 3:5 -5:11 years produced the same phonological process though the number of clients who produced it was less.

4.3.2 Deletion

There were two categories of deletion realized in the study that is, cluster reduction and final consonant deletion.

Cluster Reduction

Cluster reduction is when some or all parts of a cluster are deleted or substituted, (Pena-Books and Hedge, 2007). In the age category of 3:0 -3:5 years, 93 consonant clusters were realized as single consonants. For example, lower /laʊə/ for flower/flaʊə/, ky/kai/ for sky/skai/ and leep /liːp/ for sleep /sliːp/. Similar changes were realized by the clients within the age category of 3:6 -3:11 but the number of clients reduced to sixty three. In the preceding age categories, there were few phonological processes and in the last age category of 5.5 -5.11years, only 8 clients realized the consonant clusters as single consonants.

Final Consonant deletion

Final consonant deletion occurs when a consonant or a consonant cluster is left off the end of a word. As clients produced the single consonant sounds, 12 within the age category of 3:0 -3:5 years left out the final consonant. For example: /kɪʧɪ/ for kɪʧɪn/, /tiː/ for /tiːθ/ and /dɒ/ for /dɒl/. This was the only age category which had deletion of consonant sound in the final position.

4.3.3 Epenthesis

Epenthesis occurs when an unstressed vowel is placed between two consonants. During initial realization of consonant clusters, 54 clients in the age category of 3:0 –3:5 added

a vowel between the clusters. For example: girass /gIrɑːs/ for grass /grɑːs/, pulate /puleɪt/ for plate /pleɪt/ and sineik /sɪneɪk/ for snake /sneɪk/. Within the age category of 3:6 -3:11, forty five clients had the same phonological process. By the age category of 5:5 -5:11 only 6 clients realized the same phonological process.

4.3.4 Depalatization

Depalatization occur when a palatal fricative. For example, /ʃ/ is replaced with an alveolar fricative e.g. /s/. One of the phonemes produced in the study was a palatal sound (/ʃ/) in the initial, medial and final positions. In the initial position, clients within the age category of 3:0 -3:5 realized the phoneme as a non-palatal sound /s/ instead of /ʃ/. For example, fish was realized as /fɪs/ for /fɪʃ/.

4.3.5 Devoicing

During the realization of affricates, twenty two clients within the age category of 3:0 - 3:5 realized /ʤ/ as /ʧ/ in the medial and final positions. Though the sound (/ʤ/) is voiced, it was realized as voiceless (/ʧ/). For example, enchine /enʧin/ for engine /enʤɪn/ and orache /ɒrɪʧ/ for orange /ɒrɪnʤ/

4.3.6 Coalescence

Coalescence occurs when two adjacent segments are replaced by a single one which shares features of the two original ones. In the study, the researcher identified two realizations which did not fit in the phonological processes reviewed in the literature. One of them was the realization of /f/ in the medial position instead of /θ/. For example: nofing /nʌfɪŋ/ for nothing /nʌθɪŋ/. The other one was realization of /z/ in the medial position instead of /ʒ/. For example: for production of the word measure, a client articulated as /mezə/ for /meʒə/. Below is an illustration of all phonological processes in the different age groups.

4.3.7 A summary of phonological process

Some of the phonological processes described in the literature review by Bowen (2020) were realized by clients in the study. These are voicing, final consonant deletion, fronting, cluster reduction and stopping. Phonological processes realized are illustrated in table 4.31.

Table 4.31: Phonological processes realized

	Phonological Processes	**Word**	**Client's realization**	**Expected pronunciation**	**changes**
1	Stopping	Thumb	/dʌm/	/θʌm/	d is realized intead of th
		Mouth	/məʊt/	/məʊθ/	t is realized instead of th
2	Cluster reduction	Flower	/flaʊə/	/flaʊə/	/l/ is realized instead of /fl/
		Sky	/kai/	/skai/	/k/ is realized instead of /sk/
		Sleep	/liːp	/sliːp/	/l/ is realized instead of /sl/
3	Epenthesis	Grass	**/g**iras/	/gIrɑːs/	/I/ is inserted between /g/ an /r/
		Plate	**/pu**late/	/pleɪt/	/u/ is inserted between /p/ and /l/
		Snake	**/si**neik/	/sneɪk/.	/I/ is inserted between /s/ and /n/
4	Depalatization	Fish	/fi**s/**	/fɪʃ/	/s/ is realized instead of /ʃ/
5	Final consonant deletion	Kitchen	/kɪʧɪ/	kɪʧɪn/	/n/ omitted
		Teeth	/tiː/	/tiːθ/	/θ/ omitted
		Doll	/dɒ/	/dɒl/	/l/ omitted
6	Devoicing	Engine	/en**ʧ**ɪn/	en**ʤ**ɪn/	**ʧ** is realized instead of **ʤ**
		Orange	/ɒrɪ**ʧ**/	/ɒrɪ**ʤ**/	
7	Coalescence	Nothing	/nʌ**f**ɪŋ/	/nʌ**θ**ɪŋ	/f/ realized instead of /**θ**/
		Measure	/me**z**ə/	/me**ʒ**ə/	/z/ realized instead of /**ʒ**/

In the literature reviewed, Dodd et al (2003) described that stopping is resolved by 3:6 years and fronting is resolved by 4 years. This however, did not concur with the current study that both phonological processes are still realized in the age category of 5:6 to 5:11 years.

Table 4.32: Phonological processes realized per age group

phonological processes	Number of phonological processes realized per age group					
	3:0-3.5	3:6-3:11	4:0-4:5	4:6-4:11	5:0-5:5	5:6- 5:11
Cluster reduction	15	4	0	0	1	0
Final consonant deletion	93	63	14	9	5	8
Epenthesis	54	45	13	24	9	6
Fronting	10	22	4	3	1	6
Stopping	60	47	34	41	46	18
Devoicing	30	17	13	10	10	7
Coalescence	18	4	5	4	5	3

The study found that all phonological processes are still produced at the age category of 5:6 -5:11years except cluster reduction which was resolved by the age category of 5:0 -5:5 years. As shown in table 4.31, the numbers of phonological processes produced within the age category of 3:0 -3.5 years were more compared to the realizations within the age category of 5:5 -5:11years. This indicates that the number of phonological processes both in single and cluster consonants reduce with advancement of age.

4.4 Consonant phonemes mastered per sex

This study found some phonemes which are mastered earlier by one sex and later by the other.

4.4.1 Single consonants

Consonant /s/ is mastered by girls by the age category of 3:0 -3:5 years and by boys at the age category of 4:0 -4:5 years. Girls mastered /v/ at the age category of 3:0 -3:5 years but boys mastered the phoneme by the age of 3:6 -3:11 years. Boys mastered fewer phonemes compared to girls in all age groups except in the ages of 3:6 -3:11 years and 5:0 -5:5years where they both acquired same number of phonemes. The only phoneme realized correctly by both sex in all groups was /w/. Below is a summary of consonant phonemes mastered per sex.

Table 4.33: Single consonants mastered per sex

Age (years)	Boys	Girls
3:0 -3:5	/p, b, t, k, g, m, n, f, ʧ, l, w, j/	/p, b, t, g, m, n, f, v, s, ʧ, l, w, j,/
3:6 -3:11	/p, b, d, g, m, f, v, ʧ, l, r, w, j/	/p, b, d, k, g, m, f, ʧ, s, l, r, w/
4:0 -4:5	/p, b, t, d, k, g, m, n, f, ʧ, s, l, r, w, j/	/p, b, t, d, k g, m, n, f, v, ʧ, s, l, r, w, j/
4:6 -4:11	/p, b, t, d, k, g, m, n, f, v, ʧ, s, l, r, w, j/	/p, b, t, d, k, g, m, n, f, v, ʧ, ʃ s, l, r, w, j/
5:0 -5:5	/p, b, t, d, k, g, m, n, ŋ, f, ʧ, s, z, l, r, w, j, h/	/p, b, t, d, k, g, m, n, ŋ, f, ʧ, ʃ, s, l, r, w, j/
5:6 -5:11	/p, b, t, d, k, g, m, n, ŋ, f, v, ʧ, s, z, l, r, w, j/	/p, b, t, d, k, g, m, n, ŋ, f, v, ʧ, s, l, r, w, j, h/

The study found out that /k/ was mastered by boys at the age of 3:0 -3:5years but the same phoneme is not mastered at the age of 3:6 -3:11. Boys also mastered /h/ in the age category of 5:0 -5:5years but in the age category of 5:6 -5:11years the phoneme is not

mastered.in the age category of 3:0 -3:5 years, /v/ was mastered by girls but in the age category of 3:6 -3:11 it had not been mastered. These findings indicate that there are some phonemes which are mastered in an earlier age yet not mastered in an older age. This makes it complex to determine a particular age when it is to be considered mastered. An option for this may be to conclude that the phoneme is to be considered mastered within an age band of 12 months, i.e. /v/ to be considered mastered within the age category of 3:0 -3:11years.

4.4.2 Consonant clusters mastered per sex

This study found out that some cluster phonemes are acquired earlier or later by one sex compared to the other. For example, /st/ and /sp/ are clearly produced by girls by 3:11 years yet the same are acquired by boys at 4:11 years. Boys were able to master /gl/ by the age of 4:5 years yet at 5:11 years girls had not yet acquired.

By the age of 3:0 -3:5 years, each of the sexes was able to realize only one cluster consonant correctly, /sw/ and /st/ respectively. From the age of 3:6 years, girls realized more consonant clusters correctly earlier than boys in all age-groups except in the age category of 3:0 -3:5 years where each sex clearly articulated one cluster consonant and in the age category of 5:0 -5:5 years where boys had more consonants articulated correctly than girls. Below is a summary of consonant clusters mastered by sex.

Table 4.34: Consonant clusters mastered per sex

Age	**3:0-3:5**		**3:6-3:11**		**4:0-4:5**		**4:6-4:11**		**5:0-5:5**		**5:6-5:11**	
Sex	**B**	**G**	**B**	**G**	**B**	**G**	**B**	**G**	**B**	**G**	**B**	**G**
/pl/	50	82	66	82	**100**	**100**	92	**92**	100	**100**	**100**	**100**
/pr/	42	50	66	82	**92**	**100**	82	**92**	100	**100**	**100**	**100**
/bl/	58	76	66	82	**92**	**92**	100	100	100	**92**	**100**	**100**
/tr/	26	76	34	40	82	82	50	82	66	82	**92**	**92**
/dr/	34	76	76	66	76	**92**	76	**92**	**100**	**100**	**100**	**100**
/kl/	16	58	50	76	82	**92**	**92**	**100**	**100**	**100**	**92**	**92**
/kr/	34	50	58	82	**100**	**100**	**98**	**100**	**100**	**92**	**100**	**100**
/gl/	66	34	34	66	**92**	82	76	82	**92**	82	82	82
/gr/	42	66	34	58	82	92	66	**92**	**100**	**92**	**100**	**100**
/fl/	82	76	50	**100**	**92**	**100**	**92**	**100**	**100**	**100**	**100**	**100**
/fr/	58	76	66	82	**92**	**100**	82	**92**	**100**	**92**	**100**	**100**
/θr/	0	26	8	26	42	26	8	58	42	34	58	66
/sp/	66	50	78	**92**	76	**100**	**92**	**100**	**100**	**100**	**100**	**100**
/st/	58	**92**	78	**92**	82	**100**	**92**	**100**	**92**	**92**	**92**	**100**
/sk/	66	66	58	76	**92**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
/sm/	50	58	76	66	84	**100**	**100**	**100**	**100**	**92**	**100**	**100**
/sn/	58	66	**92**	76	**92**	**100**	**92**	**100**	**100**	**100**	**92**	**100**
/sw/	**100**	82	**92**	**100**	**92**	**100**	82	**100**	**100**	**100**	**100**	**100**
/sl/	16	50	50	50	**92**	**100**	82	100	**100**	100	82	**100**
Total	**1**	**1**	**2**	**4**	**11**	**16**	**10**	**16**	**17**	**16**	**16**	**15**

B boys **G** girls Highlighted: acquired consonant clusters.

In the age category of 4:0 -4:5 years boys mastered /pr/, /fr/and /sw/ but later at the age category of 4:6 -4:11 years, it does not appear mastered. The study considered this as an indication of regression. The study therefore concluded that the three clusters to be considered mastered from the age category of 4:0 -5:5 years. This implies that an SLP assessing a boy on acquisition these three consonant clusters expect mastery at a minimum of 4:0 years and a maximum of 5:5 years. A boy failing to master these sounds by the age of 5:5 years may indicate a speech sound disorder.

The study found it complex to understand the mastery of consonant clusters /gl/ and /sl/ by boys. This is because the patterns of acquisition of these two consonant clusters are irregular. They appear mastered at the age category of 4:0 -4:5 years, appeared not mastered in the age category of 4:6 -4:11years, appeared mastered at age category of 5:0 -5:5years and finally appeared not mastered at 5:6 years. The study therefore opted to consider the phonemes to be mastered in the first time it appears mastered in an age group and ignore the recurrence of not being mastered. For example, /sl/ is considered to be mastered by boys at the age category of 4:0 -4:5 years though in the age category of 4:6 -4:11 it does not appears mastered.

The age of acquisition of /sw, st, sp, fl, sw, sn/ in this study is below 4 which is contrary to what Smit et al. (1990) stipulates. Some phonemes are acquired by 4.5 years and this concurs with what is stipulated by Templin (1957). These include /pl, pr, bl, dr, kl, kr, sk, sm/. Other phonemes is /tr/ which is mastered at 5.6-5.11years which is late compared to Smit et al. (1990) whereby it is acquired by 4.6. The study found that clear production of /θr/ is not reached by 5:11years.

4.5 Comparison with Literature Reviewed

The study found that /p/, /b/, /t/, /k/ and /g/ are mastered in the age category of 3:0 -3:5 years while according to a combined data from Sander (1972), Grunwell (1981) and Smit et al. (1990), only /p/, /b/, /d/, and /k/ are the only stops mastered in the age of 3:5 years. According to McLeod and Bleile, (2003), all stops are mastered by the age 3.5 years which is contrary to le in the current study which found that all stops except /d/ are mastered in the age category same age category of 3:5 -3:5 years.

Among the nasals assessed in the study, /m/ and /n/ are mastered at the age category of 3:0 -3:5 years and this concurred with the findings of a combined data from Sander

(1972), Grunwell (1981) and Smit et al. (1990). According to Chirlian and Sharpley (1982), /ŋ/ is mastered at the age category of 3:0 -3:5 years while in the current study it is mastered in the age category of 4:6 -4:11years.

Gangji et al. (2015) explained that fricatives mastered at the age of 4 years are /z/, /s/ and /h/ while the current study found out that by the age category of 4:0 -4:5 years, /f/, /v/ and /s/ are mastered.

Maphalala, (2014) found that children acquire most isiXhosa phonemes by 3:0 years. This is contrary to the current study since only twelve out of 24 single consonants assessed had been mastered by the age of 3:0 -3:5 years. Though some isiXhosa might not be the same as English phonemes assessed in the current study. Maphalala, (2014) further suggested that affricates are among the latest acquired segments since at the age of 5:0 they were still developing This study therefore found out that between the two affricates assessed, /ʧ/ is mastered at the age category of 3:0 -3:5 and the age of 5:11 years, /ʤ/ is not mastered . This is contrary to findings of Kilminister and Laird (1998) who found that they are mastered at the age of 4:0 -4:5 years.

The study found that /pl/, /pr/, /bl/, /kr/, /fl/, and /sk/ are mastered at the age category of 4:0 -4:5 years. This supports findings of Smit et al. (1990) that /pl/ and /bl/ are mastered at the age category of 4:0 -4:5years but does not support the findings that /kr/, /fl/ and /sk/ are mastered at the age of 4:6 -4:11 years.

The study found out that all phonological processes realized at the age category of 3:0 -3:5 years were realized at the age category of 5:6 -5:11years except cluster reduction which was not realized in the age of 5:5 -5:11 years. The frequency of phonological processes realized within the age category of 3:0 -3:5 years was more compared to the

realizations within the age category of 5:5 -5:11years. For example, final consonant deletion was realized by 93 clients in the age category of 3:0 -3:5 years and 8 clients at the age category of 5:5 -5:11 years. This indicated that the number of phonological processes reduced with advancement of age.

This study found out that phonological processes reduced with advancement in age and this agreed with the findings of Dodd et al. (2004) who found out that older children had more accurate production and fewer error pattern in their speech.

The study further found out that some cluster phonemes are acquired earlier or later by one sex compared to the other. For example, /st/ and /sp/ are clearly produced by girls by 3:11 years yet the same are acquired by boys at 4:11 years.

This study found that girls realize more consonant clusters correctly earlier than boys in all age categories except in age category of 5:0 -5:5 years and 5:6 -5:11 years. In the age category of 3:0 -3:5ears, each sex clearly articulated one cluster consonant and in the age category of 5:0 -5:5 years, boys had more consonant articulated correctly than girls.

In a study by Smit et al. (1990), sex of the child had a significant influence in some of the preschool age groups. This study however did not find any significant difference in scores for boys and girls in all the assessed phonemes except sounds /dr/ and /st/. Boys mastered sound /st/ at the age category of 4:5 -4:11 years while girls mastered the same cluster consonant at the age of 3:0- 3:5 years. Boys mastered /dr/ at the age category of 5:0 -5:5 years while girls mastered at the age category of 4:0 -4:5 years.

CHAPTER FIVE

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of findings, conclusions and recommendations of the study. The aim of the study was to determine the pattern of acquisition of sound segments and phonological processes among children aged 3:0 -5:11 years in Kenya. This was guided by three objectives; 1) to determine the pattern of acquisition of sound segments at different age levels, 2) to establish the pattern of phonological processes in operation and 3) to determine the pattern of acquisition of sound segments in relation to sex.

The study was based on the assumption that acquisition of sound segments increases with age, phonological processes decrease with increase in age and girls' speech develop earlier than boys.

5.2 Summary of the Findings

Study findings have been presented and discussed below:

5.2.1 Findings on acquisition of consonants

Stops mastered at the age category of 3:0 -3:5 years are /p/, /b/, /t/, /k/ and /g/ while /d/ is mastered by the age category of 3:0 -4:5 years. The only fricative mastered at the age of 3:0 -3:5 years is /f/ and /s/ is the only one mastered in the age of 3:6 -3:11. The third fricative to be mastered is /v/ in the age category of 4:0 -4:5 years, /ʃ/ in the age category of 4:6 -4:11 and lastly /z/ and /h/ in the age category of 5:0- 5:5. Fricatives not mastered by the age category of 5:11 years are /θ/, /ð/ and /ʒ/.

In the two affricates assessed, /ʧ/ is mastered by the age of 3:0- 3:5 while by the age of 5:5 -5:11 years, /ʤ/ is not yet mastered. By the age of 3:0- 3:5, two nasals are mastered;

/m/ and /n/ but /ŋ/ is mastered by the age category of 4:6- 4.11years. Glides are mastered by the age category of 3:0 -3:5years and between the two laterals studied, /l/ is mastered by the age category of 3:0 -3:5 and /r/ in the age category of 3:6 to 3:11.

In the age category of 3:0 -3:5 years, the only consonant cluster realized correctly by girls was /st/. Boys mastered /sw/. Most of the clusters are mastered by the age of 4:0 -4:11 years and these are: pl, bl, kr, fl, sk, sm, sn and sl/. At the age of 4:6 -4:11, /kl/, /sp/, and st/ are mastered and at the age of 5:0 -5:5 years /dr and /gr/ are mastered. Lastly /tr/ is mastered by the age of 5.6 -5:11 years. The study found out that the age of acquisition of /sw, st, sp, fl, sw, sn/ is between the age category of 3:0 -3:11 years while by the age of 4:5 years, /pl, pr, bl, dr, kl, kr, sk, sm/ are acquired. The study found out that clear production of /θr/ and /gl/ is not reached by 5.11years.

Phonological processes realized

Phonological processes realized in the age category of 3:0 to 5:11 years are depalatization of /s/ for /ʃ/, voicing, /dreın/ as in /treın/, cluster reduction (/kai/ for /skai/), epenthesis as in /gIrɑ:s/ for /grɑ:s/, and stopping /drı:/ for /θrı:/ and these processes reduced with advancement in age.

Sound acquisition according to sex

Some phonemes are mastered earlier by one sex and later by the other. For example, /s/ is mastered by girls by the age of 3:5 years and the same phoneme is mastered by boys by the age of 4:5. Girls master /v/ by 3:5 year of age but boys master the phoneme by the age of 3:11.

Boys acquired fewer phonemes compared to girls in all age groups except in the ages of 3:6- 3:11 and 5:0 -5:5 years where they both acquired same number of phonemes. /w/ is the only phoneme realized correctly by both sexes in all groups.

5.3 Conclusions

Certain conclusions can be arrived at from the findings of this study. During an SLP assessment of speech sound disorders, a child's production of sounds is compared to their sex and age matched peers using the norms tables (Appendix 19 and 25). For example, if a 5:3 year old boy is not able to produce /ʃ/ correctly in medial position, by looking up the boys' norms under 5:0 -5:5 year olds, medial/ʃ/, we can see that 91% of his peers in the normative sample did produce that sound correctly in the assessment done to Kenyan Children.

The sequence of sound acquisition of /p, b, t, k, g m, n, f, w/ are among the first to be acquired and / θ, ð/ are among the last to be acquired. As children get older, their speech becomes more accurate, more sounds are articulated correctly and few error patterns are realized. When assessing speech sound disorder, a clinician should consider both age and sex since some sounds are acquired earlier or later in age depending on sex.

5.4 Recommendations

The researcher hopes that this study will be used as a basis for further researchers within Speech and Language Pathologists/ therapists in the Association of Speech and Language Therapists Kenya, Early childhood development centres, Ministry of Health, parents and any other interested party especially here in Kenya and Eastern Africa. From the study, the following recommendations are drawn:

i. The sequence of sound acquisition of: /p, b, t, k, g m, n, f, w, / are among the first acquired and /θ, ð/ are among the last acquired. This information is

important for teachers in EYE centres. It would be interesting if the curriculum developers in the country; Kenya Institute of Curriculum Development (KICD) integrates this in teachers training institutions.

ii. These results have a lot of significance in the assessment of speech developmental disorders. SLPS can therefore use. Majority of school children in Kenya are referred to the Education Assessment and Resource Officers (EARCs) for assessment, referrals and placement. The results of this research will act as a guide for referrals to therapy services

iii. It is recommended that since Kenya is a multilingual country, SLPs to be aware of different dialectal features when analysing phonological productions so that this may not be considered as errors.

iv. This study assessed expressive phonology in children by using a standardized assessment tool called South Tyneside Assessment of Phonology, (STAP) by Armstrong and Ainley (2012). The tool consists of 27 coloured pictures of objects which encourage the child to name 74 elements which produce consonant phoneme in all positions (initial, medial and final) and clusters. Some of the items/pictures in the tool were complex for Kenyan children to identify. For example, pram (final /m/), telly (medial /l/), and clown (initial /kl/). More research therefore needs to be carried out to find ways of linking with each community to make resources which are culturally secure to fit Kenyan children.

v. Swahili is spoken by majority Kenyans. Research needs to be carried out to determine Swahili speech sound development pattern within the age category of 3:0 -3:11 years.

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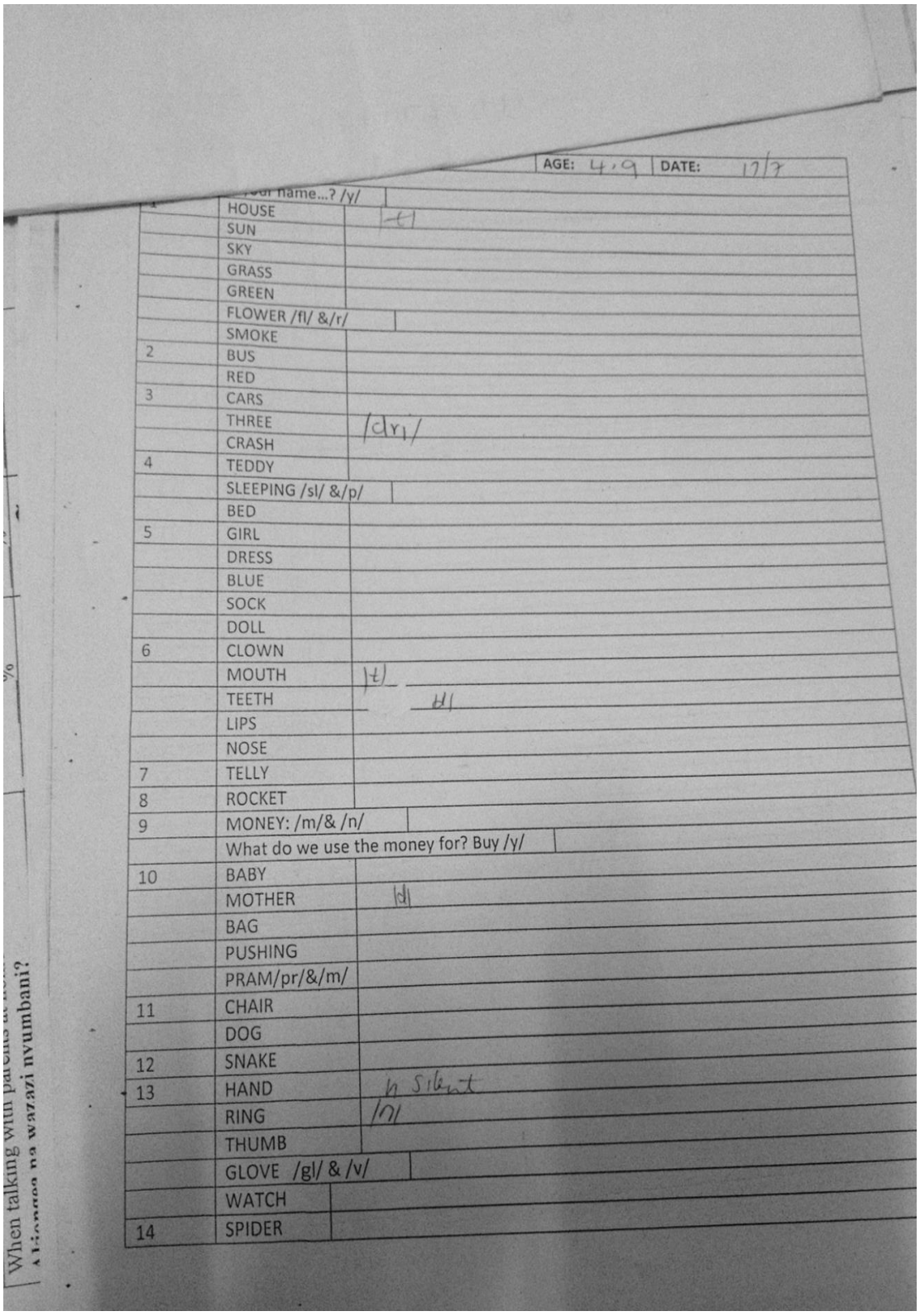
APPENDICES

Appendix 1: Phonological sampling form (a)

Name		**Age**		**Date**	
PICTURE		**Realization**	**PICTURE**	**ITEM**	**Realization**
1	HOUSE			GLOVE	
	SUN			WATCH	
	SKY		14	SPIDER	
	GRASS			WEB	
	GREEN			CUP	
	FLOWER			COFFEE	
	SMOKE			SAUCER	
2	BUS			SUGAR	
	RED			MEASURE	
3	CARS		15	FISH	
	THREE			SWIMMING	
	CRASH		16	FROG	
4	TEDDY			CROWN	
	SLEEPING		17	VEST	
	BED		18	TABLE	
5	GIRL			PLATE	
	DRESS			KNIFE	
	BLUE			FORK	
	SOCK			SPOON	
	DOLL			CUP	
6	CLOWN			COFFEE	
	MOUTH			SAUCER	
	TEETH			SUGAR	
	LIPS		19	JAM	
	NOSE		20	ORANGE	
7	TELLY		21	ENGINE	
8	ROCKET			TRAIN	
9	MONEY			BRIDGE	
10	BABY		22	LETTER	
	MOTHER			STAMP	
	BAG		23	ZIP	
	PUSHING		24	COOKER	
	PRAM			OVEN	
11	CHAIR			PAN	
	DOG			KITCHEN	
12	SNAKE		25	TEACHER	
13	HAND		26	SCISSORS	
	FINGER			MEASURE	
	RING		27	SWEETIES	
	THUMB				

Appendix 2: Phonological sampling form (b)



AGE: 4;9 DATE: 17/7

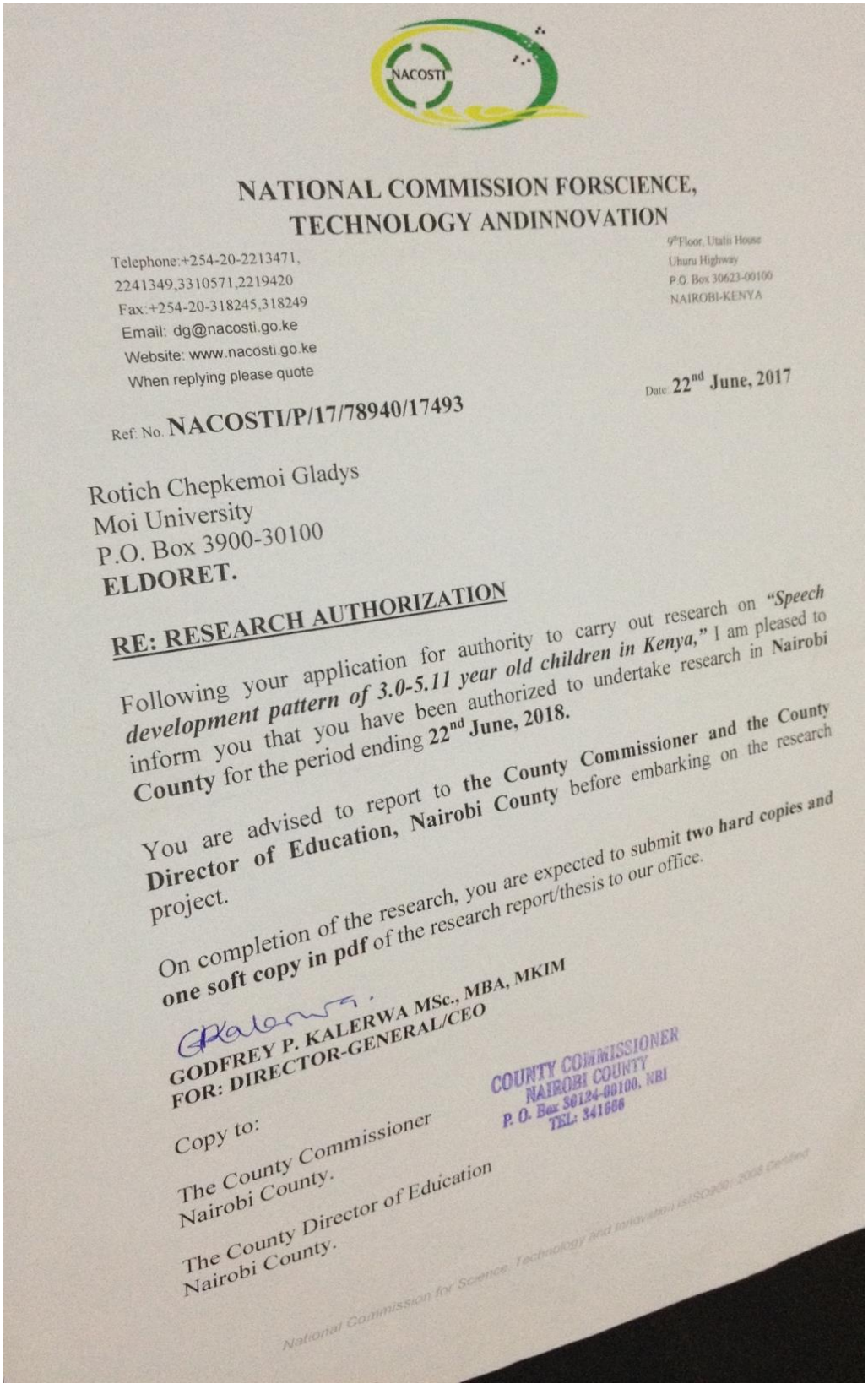
1	...? /y/
	HOUSE
	SUN
	SKY
	GRASS
	GREEN
	FLOWER /fl/ &/r/
	SMOKE
2	BUS
	RED
3	CARS
	THREE
	CRASH
4	TEDDY
	SLEEPING /sl/ &/p/
	BED
5	GIRL
	DRESS
	BLUE
	SOCK
	DOLL
6	CLOWN
	MOUTH
	TEETH
	LIPS
	NOSE
7	TELLY
8	ROCKET
9	MONEY: /m/& /n/
	What do we use the money for? Buy /y/
10	BABY
	MOTHER
	BAG
	PUSHING
	PRAM/pr/&/m/
11	CHAIR
	DOG
12	SNAKE
13	HAND
	RING
	THUMB
	GLOVE /gl/ & /v/
	WATCH
14	SPIDER

When talking with parents

Appendix 3: Single consonants and consonant clusters assessed

CONSONANT PHONEME	**I**	**M**	**F**		**CONSONANT CLUSTER**		
p	pan	spoon	cup	pl	plate	fl	flower
b	bus	baby	web	pr	pram	fr	frog
t	table	letter	rocket	bl	blue	θr	three
d	dog	teddy	bed	br	bridge	sp	spider
k	cars	cooker	sock	tr	train	st	stamp
g	girl	sugar	bag	dr	dress	sk	Sky
m	money	swimming	pram	kl	clown	sm	smoke
n	knife	snake	kitchen	kr	crash	sn	snake
ŋ		singing	ring	gl	glove	sw	sweets
f	fork	coffee	knife	gr	green	sl	sleeping
v	vest	oven	glove				
θ	thumb	nothing	mouth				
ð	the	mother	teeth				
s	sun	saucer	house				
z	zip	scissors	nose				
ʃ	sugar	pushing	fish				
ʒ		measure					
ʧ	chair	teacher	watch				
ʤ	jam	engine	orange				
L	lips	telly	doll				
R	red	grass					
w	web	crown					
J	yes	praying	sky				
H	hand						

Appendix 4: NACOSTI authorization letter



NATIONAL COMMISSION FORSCIENCE,
TECHNOLOGY ANDINNOVATION

Telephone:+254-20-2213471,
2241349,3310571,2219420
Fax:+254-20-318245,318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/17/78940/17493**

Date: **22nd June, 2017**

Rotich Chepkemoi Gladys
Moi University
P.O. Box 3900-30100
ELDORET.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Speech development pattern of 3.0-5.11 year old children in Kenya,"*** I am pleased to inform you that you have been authorized to undertake research in **Nairobi County** for the period ending **22nd June, 2018.**

You are advised to report to **the County Commissioner and the County Director of Education, Nairobi County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

COUNTY COMMISSIONER
NAIROBI COUNTY
P. O. Box 30124-00100, NBI
TEL: 341666

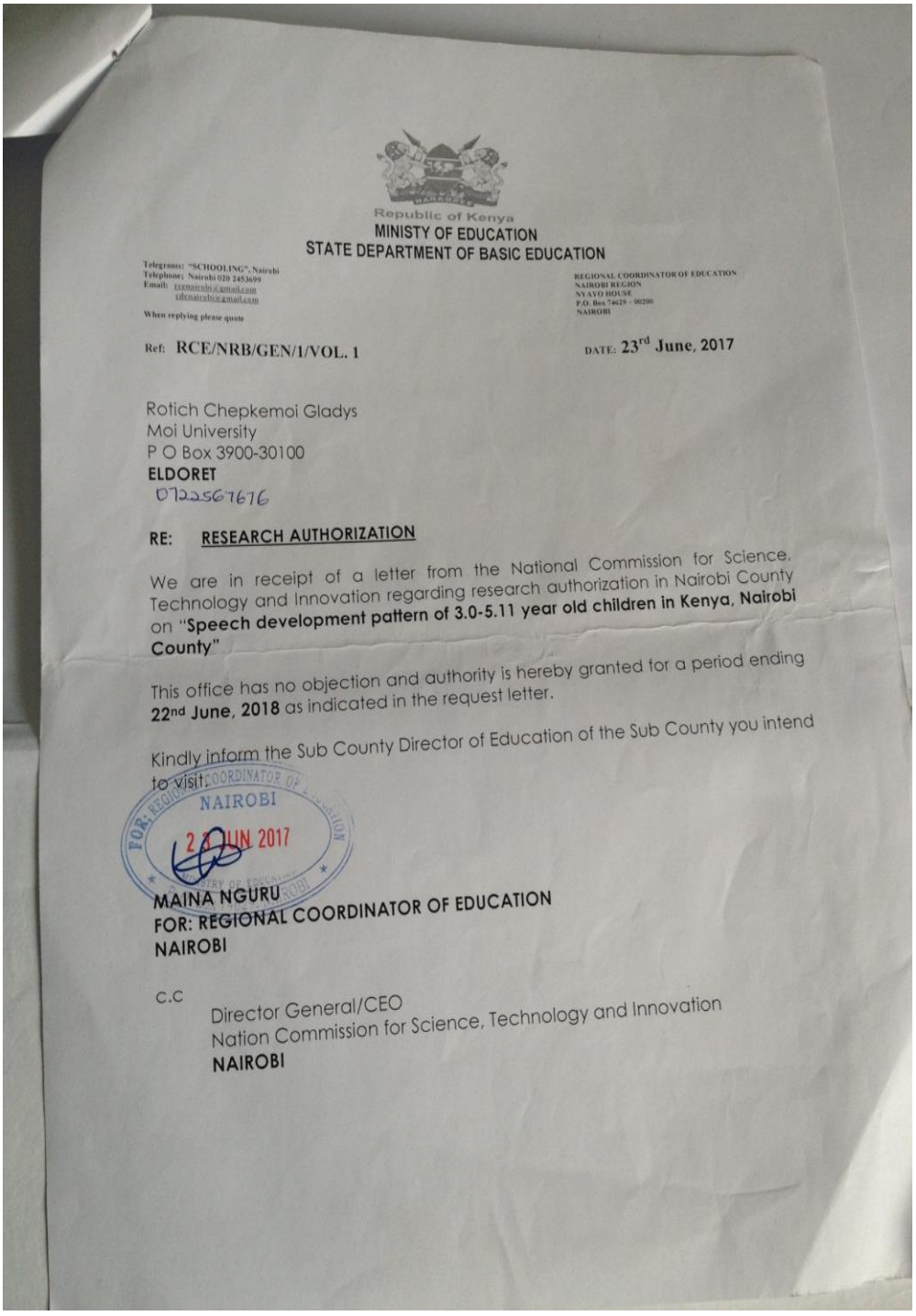
Copy to:

The County Commissioner
Nairobi County.

The County Director of Education
Nairobi County.

National Commission for Science, Technology and Innovation ISO9001: 2008 Certified

Appendix 5: County research authorization letter



Republic of Kenya
MINISTY OF EDUCATION
STATE DEPARTMENT OF BASIC EDUCATION

Telegrams: "SCHOOLING", Nairobi
Telephone: Nairobi 020 2453699
Email: rcenairobi-c@gmail.com
cdenairobi@gmail.com

When replying please quote

REGIONAL COORDINATOR OF EDUCATION
NAIROBI REGION
NYAYO HOUSE
P.O. Box 74629 - 00200
NAIROBI

Ref: RCE/NRB/GEN/1/VOL. 1

DATE: 23rd June, 2017

Rotich Chepkemoi Gladys
Moi University
P O Box 3900-30100
ELDORET
0722567676

RE: RESEARCH AUTHORIZATION

We are in receipt of a letter from the National Commission for Science, Technology and Innovation regarding research authorization in Nairobi County on "**Speech development pattern of 3.0-5.11 year old children in Kenya, Nairobi County**"

This office has no objection and authority is hereby granted for a period ending **22nd June, 2018** as indicated in the request letter.

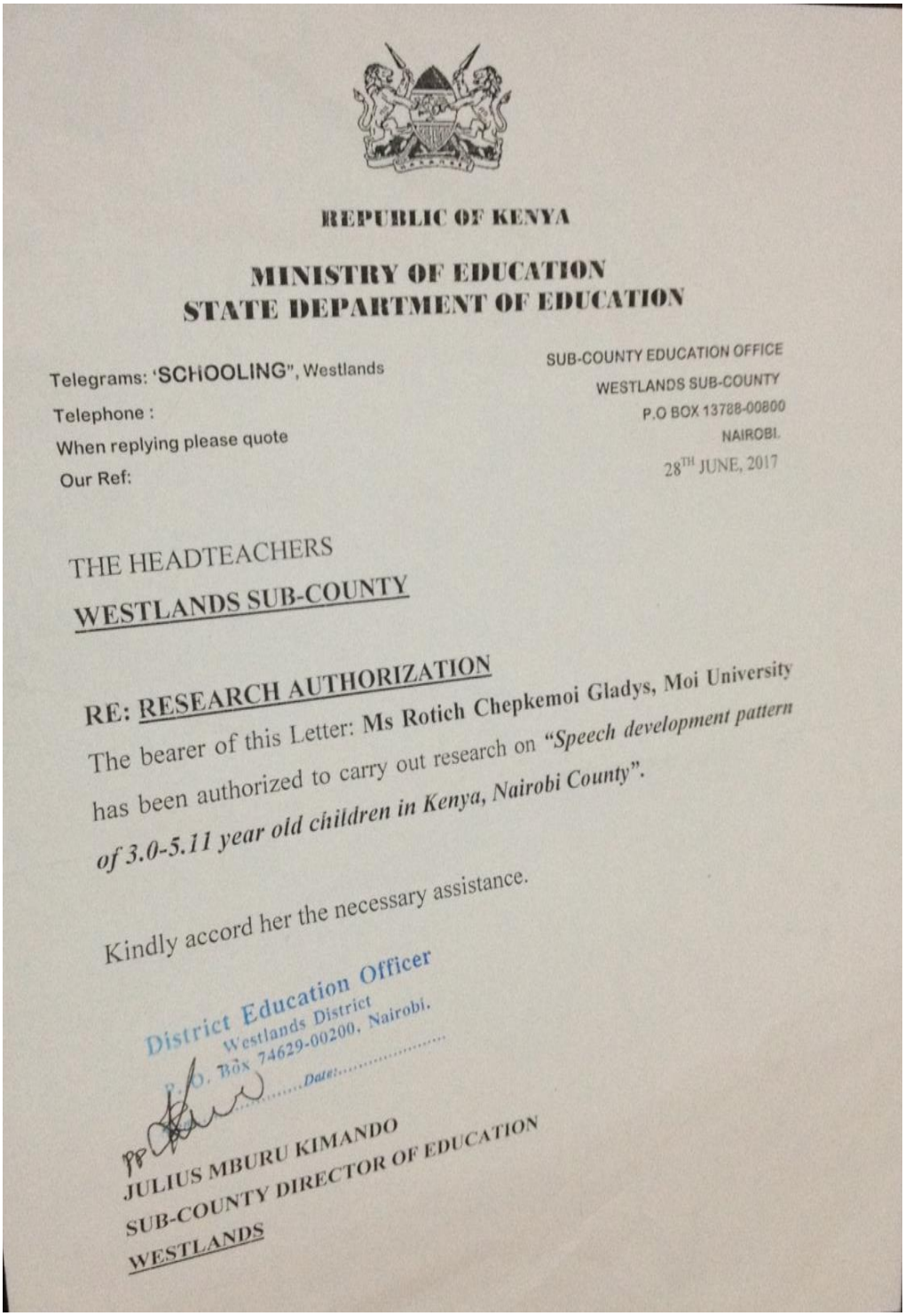
Kindly inform the Sub County Director of Education of the Sub County you intend to visit.

NAIROBI
23 JUN 2017

MAINA NGURU
FOR: REGIONAL COORDINATOR OF EDUCATION
NAIROBI

c.c
Director General/CEO
Nation Commission for Science, Technology and Innovation
NAIROBI

Appendix 6: Research authorization in Westlands Sub County.



REPUBLIC OF KENYA

MINISTRY OF EDUCATION
STATE DEPARTMENT OF EDUCATION

Telegrams: "SCHOOLING", Westlands
Telephone :
When replying please quote
Our Ref:

SUB-COUNTY EDUCATION OFFICE
WESTLANDS SUB-COUNTY
P.O BOX 13788-00800
NAIROBI.
28TH JUNE, 2017

THE HEADTEACHERS
WESTLANDS SUB-COUNTY

RE: RESEARCH AUTHORIZATION

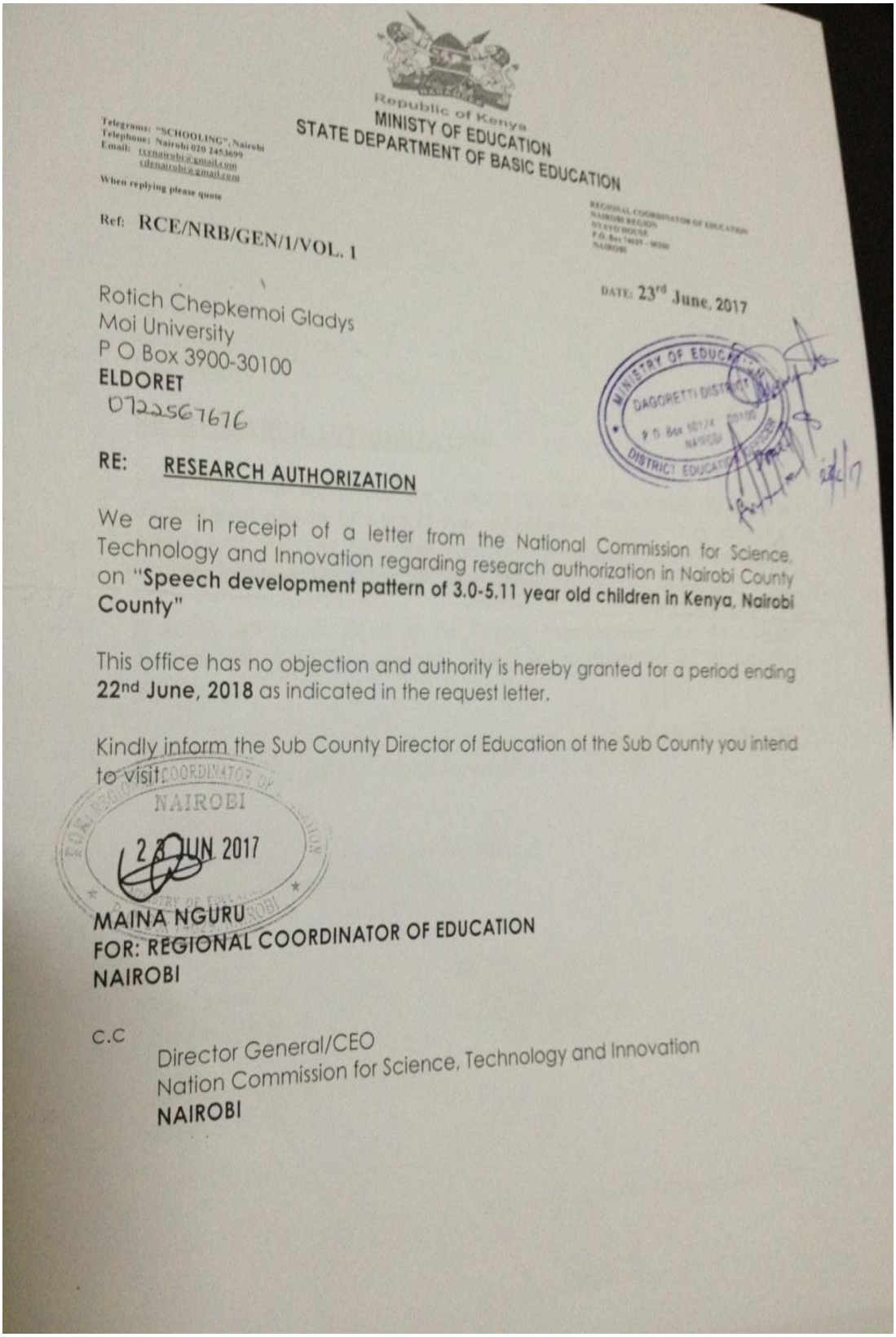
The bearer of this Letter: Ms Rotich Chepkemoi Gladys, Moi University has been authorized to carry out research on *"Speech development pattern of 3.0-5.11 year old children in Kenya, Nairobi County"*.

Kindly accord her the necessary assistance.

District Education Officer
Westlands District
P. O. Box 74629-00200, Nairobi.
Date:.....

JULIUS MBURU KIMANDO
SUB-COUNTY DIRECTOR OF EDUCATION
WESTLANDS

Appendix 7: Research permit: Dagoretti Sub County



Republic of Kenya
MINISTY OF EDUCATION
STATE DEPARTMENT OF BASIC EDUCATION

Telegrams: "SCHOOLING", Nairobi
Telephone: Nairobi 020 2453699
Email: rcenairobi@gmail.com
cdenairobi@gmail.com
When replying please quote

REGIONAL COORDINATOR OF EDUCATION
NAIROBI REGION
ST.LYD HOUSE
P.O. Box 74629 - 00200
NAIROBI

Ref: RCE/NRB/GEN/1/VOL. 1

DATE: 23rd June, 2017

Rotich Chepkemoi Gladys
Moi University
P O Box 3900-30100
ELDORET
0722567676

MINISTRY OF EDUCATION
DAGORETTI DISTRICT
P. O. Box 10124 - 00100
NAIROBI
DISTRICT EDUCATION OFFICER

RE: RESEARCH AUTHORIZATION

We are in receipt of a letter from the National Commission for Science, Technology and Innovation regarding research authorization in Nairobi County on "**Speech development pattern of 3.0-5.11 year old children in Kenya, Nairobi County**"

This office has no objection and authority is hereby granted for a period ending **22nd June, 2018** as indicated in the request letter.

Kindly inform the Sub County Director of Education of the Sub County you intend to visit.

REGIONAL COORDINATOR OF EDUCATION
NAIROBI
23 JUN 2017

MAINA NGURU
FOR: REGIONAL COORDINATOR OF EDUCATION
NAIROBI

C.C
Director General/CEO
Nation Commission for Science, Technology and Innovation
NAIROBI

Appendix 8: University authorization letter

ROTICH GLADYS
MOI UNIVERSITY
P. O BOX 3900
ELDORET, KENYA

THE PRINCIPAL
PRIMARY SCHOOL
NAIROBI

Dear Sir/Madam,

RE: REQUEST FOR PERMISSION TO CONDUCT A RESEARCH PROJECT

I am a Masters student at the department of linguistics and foreign languages, Moi University. In addition, I am a Special Needs Education teacher at Kiambu County. In the course of my work, often I have had great difficulty attending children with speech problems in our special and regular schools. This made me to pursue for the present study.

The aim of the study is to describe speech developmental pattern of 3.0-5.11 year old children in Kenya.

I would like to conduct a research project at you school. Six groups are necessary with four children per age group. The age groups are:

3.0 to 3.5	4.6 to 4.11
3.6 to 3.11	5.0 to 5.5
4.0 to 4.5	6.0 to 5.11

A total of 12 normally developing children are therefore needed. An assessment will be done to each child at this will take approximately 20 minutes per child. I promise to make every effort not to disrupt the school programme while collecting the data and all the information will be confidential.

I am hopeful that you will give me this opportunity. I will be glad to share the findings with you and the parents regarding any aspect of speech development that are of interest to you or would be beneficial to your school.
If you have further questions, feel free to contact me by calling

Yours sincerely,

Rotich Gladys Chepkemoi

Appendix 9: Consent form

CONSENT FORM

Child's Name: ----------

Parent/Guardian's Name: ----------

I accept my child to be a participant in the study on speech developmental pattern of children between the ages of 3:0 to 5:11.

Would you like a summary of the findings? √ YES NO

Parent/guardian's signature----------date----------

Appendix 10: A letter to the parent/guardian

ROTICH CHEPKEMOI GLADYS
SPEECH & LANGUAGE PATHOLOGY STUDENT
MOI UNIVERSITY
P. O BOX 3900

23rd May, 2017

Dear Parent/Guardian,

I am a Masters Degree student at Moi University. The school principal has allowed me to conduct a research project at the school. I will be conducting a study on the speech developmental pattern of children between the ages of 3:0 to 5:11.

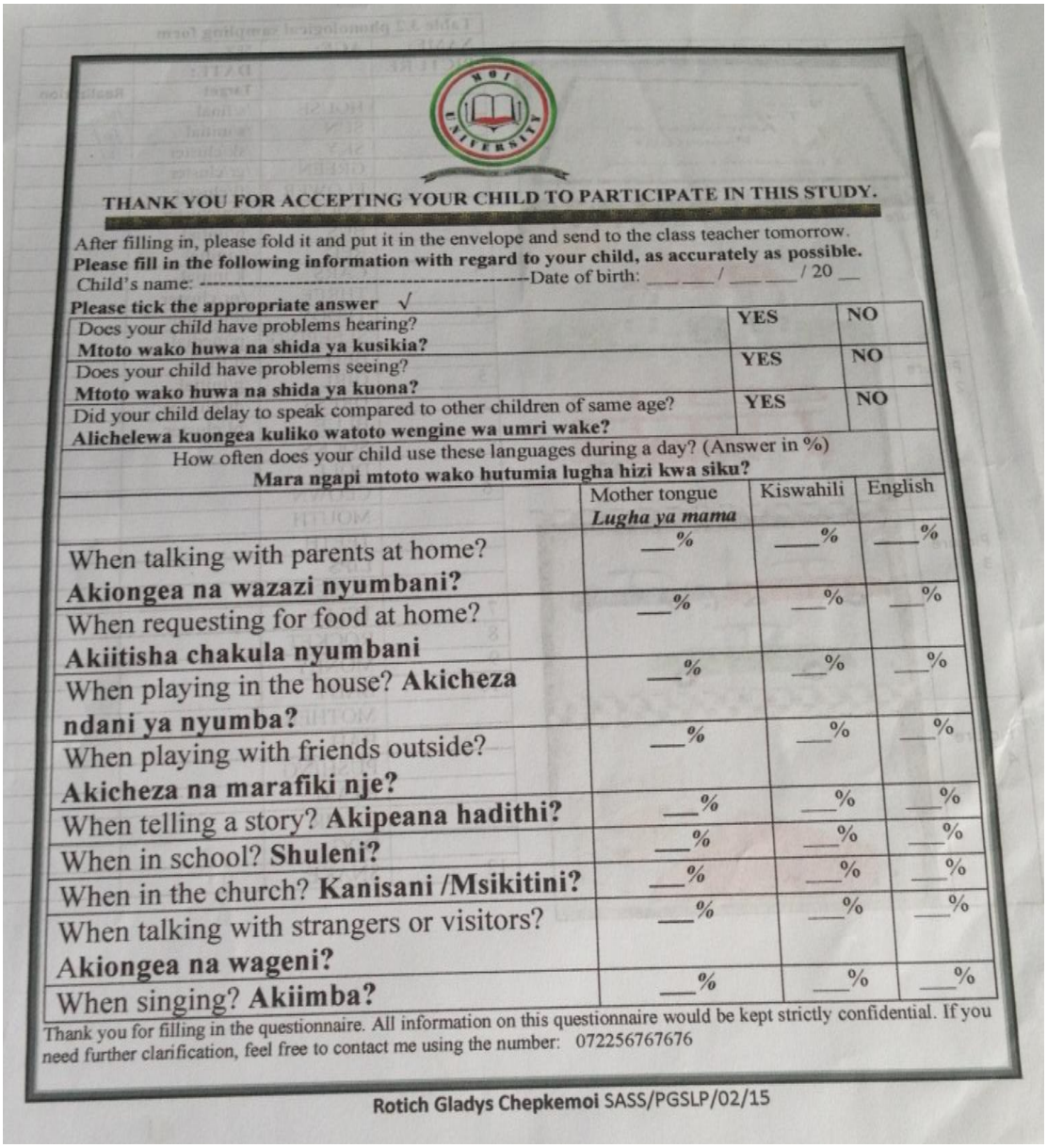
To conduct the project, I kindly request for your child to participate in the study. Your child's speech will be assessed through picture naming and I will take approximately 20 minutes of your child's time. All individual information will be kept confidential.

If you consent, please sign the attached consent form and send to the class teacher tomorrow. If you consent, I will forward a short questionnaire to you to fill in. I will be happy to share the findings of the study at your request.

Yours faithfully

Rotich Chepkemoi Gladys

Appendix 11: A Questionnaire to the parent/guardian



THANK YOU FOR ACCEPTING YOUR CHILD TO PARTICIPATE IN THIS STUDY.

After filling in, please fold it and put it in the envelope and send to the class teacher tomorrow.
Please fill in the following information with regard to your child, as accurately as possible.
Child's name: ----------Date of birth: ___ ___ / ___ ___ / 20 __

Please tick the appropriate answer √

Does your child have problems hearing? **Mtoto wako huwa na shida ya kusikia?**	**YES**	**NO**
Does your child have problems seeing? **Mtoto wako huwa na shida ya kuona?**	**YES**	**NO**
Did your child delay to speak compared to other children of same age? **Alichelewa kuongea kuliko watoto wengine wa umri wake?**	**YES**	**NO**

How often does your child use these languages during a day? (Answer in %)
Mara ngapi mtoto wako hutumia lugha hizi kwa siku?

	Mother tongue *Lugha ya mama*	Kiswahili	English
When talking with parents at home? **Akiongea na wazazi nyumbani?**	___%	___%	___%
When requesting for food at home? **Akiitisha chakula nyumbani**	___%	___%	___%
When playing in the house? **Akicheza ndani ya nyumba?**	___%	___%	___%
When playing with friends outside? **Akicheza na marafiki nje?**	___%	___%	___%
When telling a story? **Akipeana hadithi?**	___%	___%	___%
When in school? **Shuleni?**	___%	___%	___%
When in the church? **Kanisani /Msikitini?**	___%	___%	___%
When talking with strangers or visitors? **Akiongea na wageni?**	___%	___%	___%
When singing? **Akiimba?**	___%	___%	___%

Thank you for filling in the questionnaire. All information on this questionnaire would be kept strictly confidential. If you need further clarification, feel free to contact me using the number: 072256767676

Rotich Gladys Chepkemoi SASS/PGSLP/02/15

Appendix 12: Realization of single consonant phonemes at 3:0 -3:5 years

Phonemes and positions			Names of clients assessed																						
			DC	EM	HZ	D	SM	AM	MM	RH	D	MN	LM	DM	TM	BJ	HY	JO	JY	BW	BM	SK	LW	BS	AW	QM
1	/p/	I	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/
		M	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/
		F	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/t/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/
2	/b/	I	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/
		M	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/
		F	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/
3	/t/	I	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/d/	/t/	/t/	/t/	/t/	/d/
		M	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/k/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/
		F	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/
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		F	/d/	/d/	/d/	/d/	/d/	/t/	/d/	/t/	/t/	/t/	/t/	/t/	/d/	/d/	/d/	/t/	/t/	/d/	/t/	/d/	/d/	/t/	/d/	/d/
5	/k/	I	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/g/	/g/	/k/
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		F	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/b/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/

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		M	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/
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		M	/d/	/t/	/f/	/f/	/f/	/θ/	/θ/	/d/	/f/	/θ/	/f/	/θ/	/f/	/s/	/f/	/s/	/f/	/z/	/s/	/s/	/θ/	/t/	/θ/	/θ/
		F	/t/	/t/	/t/	/θ/	/t/	/t/	/t/	/d/	/t/	/t/	/θ/	/t/	/t/	/s/	/θ/	//	/t/	/t/	/θ/	/s/	/θ/	/t/	/θ/	/t/
13	/ð/	I	/d/	/ð/	/ð/	/d/	/d/	/d/	/d/	/ð/	/d/	/f/	/f/	/d/	/z/	/f/	/ð/	/ð/	/t/	/ð/	/d/	/t/	/ð/	/d/	/ð/	/d/
		M	/d/	/ð/	/d/	/ð/	/ð/	/s/	/d/	/s/	/d/	/t/	/ð/	/ð/	/d/	/s/	/ð/	/d/	/d/	/z/	/t/	/ð/	/ð/	/ð/	/ð/	/ð/
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15	/z/	I	/z/	/z/	/z/	/z/	/z/	/ʧ/	/z/	/ʃ/	/z/	/z/	/θ/	/z/	/z/	/z/	/z/	/z/	/θ/	/z/	/z/	/z/	/z/	/z/	/z/	/z/
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16	ʃ/	I	/s/	/ʃ/	/ʃ/	/ʃ/	/s/	/ʃ/	/ʃ/	/s/	/ʃ/	/s/	/ʃ/	/ʃ/	/ʃ/	/s/	/s/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/s/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/s/
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18	/ʧ/	I	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/s/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/
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21	/r/	I	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	//	/r/	/r/	/r/	/r/	//	//	//	//	/r/	//	//	/r/	/r/	/r/	/r/
		M	/r/	/r/	/r/	/r/	/r/	/r/	//	/r/	//	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/
22	/w/	I	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/r/	/w/	/w/
		M	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/r/	/w/	/w/
23	/j/	I	/j/	/j/	/j/	/j/	/j/	//	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/r/	/j/	/j/
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24	/h/	I	//	/h/	//	/h/	/h/	/h/	//	/h/	//	//	//	/h/	//	//	/h/	//	//	//	//	//	//	/r/	/h/	/h/

Appendix 13: Realization of single consonants at 3:6 -3:11 years

Phonemes and positions			Names of clients assessed																					
			EN	BMu	AM	DL	CM	WN	BMa	MO	HM	Aki	AKa	KO	SM	VM	AW	L	T	AK	PM	VB	JG	EW	BW
1	/p/	I	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/
		M	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/
		F	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/
2	/b/	I	/b/	/b/	/b/	/b/	/b/	/b/	/p/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/
		M	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/
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7	/m/	I	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m	/m	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/
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		F	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m	/m	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/
8	/n/	I	/n/	/n/	/n/	/n/	/n/	/d/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/l/	/l/	/n/	/n/	/n/

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15	/z/	I	/z/	/z/	/z/	/z/	/s/	/s/	/h/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/s/	/s/	/s/
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17	/ʒ/	M	/z/	/s/	/s/	/ʒ/	/z/	/s/	/ʧ/	/ʒ/	/s/	/ʒ/	/ʒ/	/ʒ/	/ʒ/	/ʒ/	/ʒ/	/s/	/ʒ/	/s/	/s/	/ʒ/	/z/	/θ/	/z/

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		F	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/
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		M	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/
22	/w/	I	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/
		M	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/
23	/j/	I	/j/	/j/	/j/	/j/	/j/	/j/	//	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/
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24	/h/	I	/h/	//	/h/	/h/	/h/	//	/h/	/h/	/h/	/h/	/h/	/h/	/h/	/h/	//	/h/	/h/	//	/h/	/h/	//	/h/	/h/

Appendix 14: Realizations of single consonants at 4:0 -4:5 years

Phonemes and positions			**Names of clients assessed**																						
			BJ	FM	DK	DM	PG	GC	AK	BM	SM	TM	JO	IM	SW	XG	MM	FN	NC	PAd	SW	PWi	PAw	GG	PWa	Gr
1	**/p/**	I	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/
		M	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/
		F	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/
2	**/b/**	I	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/
		M	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/
		F	/b/	/b/	/t/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/
3	**/t/**	I	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/
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4	**/d/**	I	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/
		M	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/
		F	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/t/	/d/	/d/	/d/	/d/
5	**/k/**	I	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/g/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/
		M	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/
		F	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/g/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/
6	**/g/**	I	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/
		M	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/
		F	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/
7	/m/	I	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/
		M	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/
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8	**/n/**	I	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/
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9	**/ŋ/**	M	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋg	/ŋg/
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10	**/f/**	I	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/
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11	**/v/**	I	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/
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12	**/θ/**	I	/θ/	/s/	/t/	/θ/	/s/	/θ/	/d/	/θ/	/s/	/z/	/θ/	/θ/	/θ/	/f/	/θ/	/θ/	/θ/	/θ/	/θ/	/θ/	/d/	/s/	/θ/	/θ/
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13	**/ð/**	I	/t/	/t/	/t/	/ð/	/ð/	/ð/	/ð/	/d/	/s/	/f/	/ð/	/ð/	/ð/	/ð/	/ð/	/ð/	/ð/	/ð/	/ð/	/ð/	/ð/	/ð/	/ð/	/ð/
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14	**/s/**	I	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/
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15	**/z/**	I	/z/	/s/	/z/	/s/	/z/	/z/	/z/	/s/	/z/	/z/	/z/	/θ/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/
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16	**/ʃ/**	I	/ʃ/	/ʃ/	/ʃ/	/s/	/s/	/s/	/ʃ/	/s/	/ʃ/	/s/	/ʃ/	/ʃ/	/ʃ/	/s/	/s/	/s/	/s/	/ʃ/	/ʃ/	/s/	/ʃ/	/s/	/ʃ/	/ʃ/
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17	**/ʒ/**	M	/ʒ/	/s/	/z/	/s/	/ʃ/	/ʒ/	/ʒ/	/ʒ/	/ʃ/	/ʒ/	/ʒ/	/s/	/ʒ/	/z/	/ʒ/	/ʒ/	/ʒ/	/ʒ/	/ʃ/	/z/	/ʒ/	/s/	/ʒ/	/ʒ/
18	**/ʧ/**	I	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/
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19	**/ʤ/**	I	/ʤ/	/ʤ/	/ʧ/	/ʧ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/
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20	**/l/**	I	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/
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21	**/r/**	I	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/
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22	**/w/**	I	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/
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23	**/j/**	I	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/
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24	**/h/**	I	/h/	/h/	/h/	/h/	/h/	/h/	/h/	/h/	//	/h/	/h/	/h/	//	//	/h/	/h/	/h/	/h/	/h/	/h/	/h/	/h/	//	/h/	/h/

Appendix 15: Realization of single consonants at 4:6 -4:11 years

Phonemes and positions			HO	TO	BO	LK	SM	BB	DO	AM	AA	IM	AM	S	EN	HW	AW	AMK	MY	EM	VM	GW	JB	SW	TM	MK
1	**/p**	I	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/
		M	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/
		F	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/
2	**/b/**	I	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/
		M	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/
		F	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/
3	**/t/**	I	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/d/	/t/	/t/	/t/	/t/	/t/
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4	**/d/**	I	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/z/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/
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		F	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/t/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/
5	**/k/**	I	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/
		M	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/
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6	**/g/**	I	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/
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		F	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/k/	/g/	/g/	/g/	/g/
7	/m	I	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/
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8	**/n/**	I	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/

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9	**/ŋ/**	M	/ŋ/	/ŋ/	/ŋ/	/ŋg/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋg/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/
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10	**/f/**	I	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/p/
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11	**/v/**	I	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/
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12	**/θ/**	I	/θ/	/z/	/z/	/z/	/z/	/θ/	/θ/	/z/	/s/	/θ/	/z/	/s/	/d/	/θ/	/θ/	/θ/	/θ/	/θ/	/θ/	/θ/	/z/	/θ/	/θ/	/θ/
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13	**/ð/**	I	/ð/	/ð/	/z/	/p/	/s/	/ð/	/ð/	/z/	/ð/	/ð/	/ð/	/t/	/ð/	/ð/	/ð/	/ð/	/ð/	/z/	/d/	/ð/	/z/	/ð/	/ð/	/f/
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14	**/s/**	I	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/
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15	**/z/**	I	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/s/	/z/	/z/	/z/	/s/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/θ/
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		F	/z/	/z/	/z/	/z/	/z/	/s/	/θ/	/z/	/z/	/z/	/z/	/z/	/s/	/z/	/z/	/s/	/z/	/z/	/z/	/z/	/s/	/z/	/z/	/z/
16	**/ʃ/**	I	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/s/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/s/	/ʃ/	/ʃ/
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17	**/ʒ/**	M	/ʒ/	/ʒ/	/ʒ/	/s/	/ʒ/	/ʒ/	/ʧ/	/ʒ/	/ʒ/	/s/	/z/	/s/	/ʒ/	/ʒ/	/ʒ/	/z/	/ʒ/	/ʒ/	/ʒ/	/ʒ/	/ʒ/	/ʒ/	/ʒ/	/z/
18	**/ʧ/**	I	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/

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19	**/ʤ/**	I	/ʤ/	/ʤ/	/ɣ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ɣ/	/ʤ/	/ʤ/	/ʤ/	/ɣ/	/ʤ/	/ʤ/	/ʤ/
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20	**/l/**	I	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/
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21	**/r/**	I	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/
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22	**/w/**	I	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/
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23	**/j/**	I	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/
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24	**/h/**	I	/h/	/h/	/h/	/h/	/tir	//	//	/h/	//	/h/	/h/	/h/	/h/	/h/	/h/	/h/	/h/	/h/	//	/h/	/h/	//	/h/	/h/

Appendix 16: Realization of single consonants at 5:0 -5:5 years

Phonemes and positions			Names of clients assessed																						
			EN	LG	FI	CM	CC	KO	PO	JK	M	CA	MM	SO	M	TMu	TMa	MS	WA	PW	MMu	ZW	JB	AMa	EW	DB
1	/p/	I	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/
		M	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/
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2	/b/	I	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/p/	/b/	/b/	/b/	/b/	/b/	/b/	/b/
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3	/t/	I	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/d/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/
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4	/d/	I	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/
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5	/k/	I	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/
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		F	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	//	/k/	/k/	/k/	/k/
6	/g/	I	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/
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7	/m/	I	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/
		M	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/
		F	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/	/m/
8	/n/	I	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/
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10	/f/	I	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/
		M	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/
		F	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/
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12	**/θ/**	I	/θ/	/z/	/s/	/z/	/θ/	/z/	/θ/	/dr/	/d/	/t/	/θ/	/θ/	/θ/	/θ/	/d/	/z/	/z/	/θ/	/θ/	/f/	/θ/	/θ/	/θ/	/d/
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13	**/ð/**	I	/s/	/ð/	/s/	/z/	/ð/	/t/	/ð/	/ð/	/t/	/t/	/ð/	/ð/	/ð/	/ð/	/d/	/f/	/z/	/ð/	/ð/	/f/	/ð/	/ð/	/ð/	/d/
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14	**/s/**	I	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/
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16	**/ʃ/**	I	/ʃ/	/ʃ/	/ʃ/	/s/	/ʃ/	/ʃ/	/s/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/s/	/ʃ/	/ʃ/	/ʃ/	/s/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/ʃ/
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17	**/ʒ/**	M	/z/	/ʒ/	/ʒ/	/z/	/ʒ/	/ʒ/	/θ/	/s/	/z/	/ʒ/	/ʒ/	/z/	/ʒ/	/ʒ/	/ʒ/	/z/	/z/	/ʒ/	/z/	/ʒ/	/ʒ/	/ʒ/	/ʒ/	/z/
18	**/ʧ/**	I	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/
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19	**/ʤ/**	I	/ʤ/	/ʧ/	/ʧ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʧ/	/ʤ/	/ʧ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/	/ʧ/	/ʧ/	/ʤ/	/ʤ/	/ʤ/	/ʤ/
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20	**/l/**	I	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/
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21	**/r/**	I	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/
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22	**/w/**	I	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/
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23	**/j/**	I	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/
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24	**/h/**	I	/h/	/h/	/h/	/h/	/h/	/h/	/h/	/h/	/h/	/h/	/h/	/h/	/h/	/h/	//	/h/	/h/	/h/	/h/	//	/h/	/h/	/h/	/h/

Appendix 17: Realization of single consonants at 5:6 -5:11 years

Phonemes and positions			Names of clients assessed																						
			IN	AI	WN	MW	IS	PO	GS	S	GC	EK	GC	EK	HN	AK	C	EM	DG	GO	MN	SK	JW	CN	SS	SO
1	**/p/**	I	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/	/p/
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2	**/b/**	I	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/
		M	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/	/b/
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3	**/t/**	I	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/d/	/d/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/	/t/
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4	**/d/**	I	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/	/d/
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5	**/k/**	I	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/	/k/
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6	**/g/**	I	/g/	/g/	/g/	/k/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/	/g/
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7	/m	I	/m	/m	/m	/m	/m	/m	/m	/m	/m	/m	/m	/m	/m	/m	/m	/m	/m	/m	/m	/m	/m	/m	/m	/m
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8	**/n/**	I	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/	/n/
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9	**/ŋ/**	M	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/n/	/n/	/n/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/	/ŋ/
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10	**/f/**	I	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/	/f/
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11	**/v/**	I	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/	/v/
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12	**/θ/**	I	/θ/	/θ/	/s/	/θ/	/z/	/θ/	/θ/	/θ/	/θ/	/θ/	/θ/	/θ/	/d/	/θ/	/θ/	/θ/	/θ/	/d/	/θ/	/θ/	/s/	/θ/	/z/	/z/
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13	**/ð/**	I	/ð/	/z/	/ð/	/ð/	/ð/	/ð/	/ð/	/ð/	/ð/	/ð/	/ð/	/ð/	/ð/	/ð/	/ð/	/ð/	/z/	/f/	/ð/	/ð/	/ð/	/ð/	/z/	/t/
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14	**/s/**	I	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/	/s/
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15	**/z/**	I	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/z/	/θ/	/z/	/z/	/z/	/z/	/s/	/s/
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16	**/ʃ/**	I	/ʃ/	/s/	/ʃ/	/ʃ/	/s/	/ʃ/	/s/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/s/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/ʃ/	/s/	/s/	/ʃ/	/ʃ/	/s/	/ʃ/	/ʃ/
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17	**/ʒ/**	M	/ʒ/	/s/	/s/	/ʧ/	/ʒ/	/ʒ/	/z/	/ʒ/	/z/	/ʧ/	/ʧ/	/s/	/ʒ/	/z/	/ʒ/	/ʒ/	/ʒ/	/z/	/s/	/ʃ/	/ʒ/	/z/	/ʒ/	/s/
18	**/ʧ/**	I	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/	/ʧ/
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		F	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	//	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/	/l/
21	**/r/**	I	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/
		M	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/	/r/
22	**/w/**	I	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/
		M	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/	/w/
23	**/j/**	I	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/
		M	//	/j/	/j/	//	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/
		F	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/	/j/
24	**/h/**	I	/h/	/h/	/h/	//	//	/h/	/h/	/h/	//	/h/	/h/	/h/	/h/	/h/	/h/	/h/	/h/	/h/	//	/h/	/h/	/h/	/h/	/h/

Appendix 18: A summary of realization of consonants in all age groups

Phoneme	Realizations in %					
	3:0 – 3:5	**3:0 -3.11**	**4:0 - 4:5**	**4:6 -4:11**	**5: 0-5:5**	**5:6 -5:11**
/p/	99	100	100	100	100	100
/b/	100	100	99	100	99	100
/t/	96	89	99	98	97	96
/d/	86	94	99	97	96	96
/k/	90	88	97	99	99	99
/g/	97	99	97	99	97	97
/m/	97	97	100	100	100	99
/n/	94	86	100	100	96	100
/ŋ/	64	50	85	90	94	87
/f/	99	97	100	99	100	100
/v/	89	89	90	95	83	95
/Θ/	13	28	46	45	47	72
/ ð/	29	24	64	58	54	80
/s/	89	97	100	99	100	100
/z/	87	83	82	85	92	87
/ʃ/	61	65	69	91	92	81
/ ʒ/	4	29	58	54	58	41
/ʧ/	92	97	99	100	99	100
/ʤ/	0	43	53	89	78	82
/l/	96	99	100	99	100	99
/r/	83	94	100	100	100	100
/w/	100	100	100	100	100	100
/j/	92	90	99	98	100	97
/h/	58	79	83	74	91	79

Appendix 19: Realization of consonant clusters at 3:0 to 3:5 years

No.	Clients	Cluster consonants																		
		pl/	**/pr/**	**/bl/**	**/br/**	**/tr/**	**/dr/**	**/kl/**	**/kr/**	**/gl/**	**/gr/**	**/fl/**	**/fr/**	**/θr/**	**/sp/**	**/st/**	**/sk/**	**/sm/**	**/sn/**	/sw/	/sl/
1	DC	/pl/	/pr/	/bul/		/t/	/dir/	/kil/	/kir/	/gl/	/gir/	/fl/	/fr/	/dir/	/sp/	/st/	/sik/	/m/	/n/	/sw/	/l/
2	EM	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
3	HZ	/pɪl/	/pur/	/bul/		/tɪr/	/dir/	/l/	/kir/	/gil/	/kl/	/fl/	/ful/	/dɪr/	/p/	/t/	/k/	/m/	/sɪn/	/sw/	/sil/
4	DC	/pl/	/fr/	/bl/		/t/	/dr/	/kil/	/kr/	/gl/	/gr/	/fl/	/fr/	/dɪr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sr/
5	SM	/pl/	/r/	/bl/		/dr/	/d/	/d/	/kir/	/g/	/gr/	/fl/	/fr/	/θɪr/	/sp/	/sit/	/sk/	/m/	/sn/	/sw/	/l/
6	AM	/l/	/pr/	/bl/		/tɪr/	/r/	/l/	/gr/	/gl/	/r/	/l/	/fr/	/θɪr/	/sip/	/tsit/	/k/	/m/	/sIn/	/sw/	/l/
7	MM	/pil/	/pur/	/bul/		/tir/	/dir/	/kil/	/kir/	/gl/	/gr/	/fl/	/fur/	/thir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sɪl/
8	RH	/pil/	/pɪr/	/bul/		/tir/	/dir/	/l/	/kir/	/gl/	/gir/	/l/	/fur/	/dir/	/sip/	/sit/	/sk/	/m/	/n/	/sw/	/s/
9	DC	/pil/	/pur/	/bul/		/tir/	/dir/	/kil/	/kir/	/gl/	/gir/	/fl/	/fur/	/thir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sɪl/
10	MN	/pl/	/r/	/bl/		/tr/	/dr/	/l/	/kr/	/l/	/gir/	/fl/	/fr/	/dr/	/sp/	/sit/	/sik/	/sm/	/sn/	/sw/	/l/
11	LM	/pil/	/pr/	/bl/		/tr/	/dir/	/kil/	/k/	/gil/	/gir/	/fl/	/b/	/thir/	/sip/	/st/	/sk/	/θm/	/sɪn/	/sw/	/sɪl/
12	DM	/pl/	/pr/	/bl/		/dr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
13	TM	/pl/	/pr/	/bl/		/tr/	/dr/	/l/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sf/	/st/	/sk/	/sm/	/sn/	/s/	/s/
14	BJ	/l/	/p/	/bl/		/r/	/dr/	/kl/	/kir/	/l/	/r/	/f/	/f/	/θɪr/	/sp/	/st/	/sk/	/st/	/sp/	/sw/	/st/
15	HY	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dɪr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
16	JO	/pl/	/pr/	/bl/		/tir/	/dir/	/l/	/kr/	/l/	/r/	/fl/	/fr/	/dɪr/	/sip/	/tit/	/sik/	/sm/	/sn/	/θw/	/sl/
17	JY	/l/	/pl/	/l/		/tr/	/r/	/l/	/r/	/l/	/r/	/fl/	/fr/	/d/	/p/	/st/	/k/	/m/	/sɪn/	/sw/	/sl/
18	BW	/pl/	/pr/	/b/		/dr/	/dr/	/kl/	/r/	/l/	/gr/	/fl/	/fr/	/θɪr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
19	BM	/pl/	/p/	/bl/		/tr/	/dr/	/d/	/k/	/gil/	/gr/	/fl/	/f/	/θɪr/	/sip/	/st/	/sik/	/sm/	/sɪn/	/sw/	/s/
20	SK	/pl/	/pl/	/bl/		/tir/	/dir/	/kl/	/kr/	/gil/	/gl/	/l/	/fl/	/θɪl/	/sip/	/st/	/sk/	/sm/	/sɪn/	/sw/	/ʧɪl/
21	LW	/pl/	/pr/	/bl/		/tr/	/dr/	/l/	/kr/	/l/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sɪm/	/sn/	/sw/	/sɪl/
22	BS	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θɪr/	/sp/	/st/	/sk/	/θm/	/sn/	/sw/	/l/
23	AW	/pl/	/pr/	/bul/		/dr/	/dr/	/kl/	/kr/	/l/	/gr/	/l/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
24	QM	/pl/	/pr/	/bl/		/dr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dr/	/s/	/st/	/k/	/m/	/sn/	/sw/	/sl/

Appendix 20: Realization of consonant clusters at 3:6 to 3.11 years

No.	Clients	Cluster consonants																		
		pl	**pr**	**bl**	**br**	**tr**	**Dr**	**kl**	**kr**	**gl**	**gr**	**fl**	**Fr**	**θr**	**Sp**	**st**	**sk**	**sm**	**sn**	**sw**	sl
1	**EN**	/pl/	/pl/	/bl/		/dr/	/dr/	/kl/	/dr/	/dl/	/dr/	/fl/	/fr/	/dil/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sIl/
2	**BMu**	/pl/	/pr	/b/		/dr/	/dr/	/l/	/kr/	/l/	/gr/	/fl/	/fr/	/dir/	/sp/	/st/	/k/	/sm/	/sn/	/sw/	/l/
3	**AM**	/l/	/pl/	/bl/		/tl/	/dir/	/kl/	/kr/	/gl/	/gir/	/fl/	/fur/	/til/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
4	**DL**	/pl/	/pr/	/bl/		/tr/	/dr/	/kil/	/kr/	/l/	/gr/	/fl/	/fr/	/dil/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
5	**CM**	/l/	/pr/	/l/		/tir/	/dr/	/l/	/r/	/l/	/r/	/l/	/fr/	/sir/	/p/	/st/	/k/	/sm/	/sin/	/sw/	/sIl/
6	**WN**	/p/	/p/	/bul/		/t/	/dr/	/gil/	/kr/	/gl/	/g/	/b/	/f/	/dir/	/sp/	/t/	/k/	/sim	/sn/	/sw/	/l/
7	**BMa**	/p/	/pr/	/bl/		//	//	//	/g/	//	/r/	/l/	/f/	/θ/	/p/	/t/	/k/	/m/	/sn/	/l/	//
8	**MO**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/l/	/r/	/l/	/fr/	/θir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
9	**HM**	/pl/	/pr/	/bl/		/tir/	/dr/	/kl/	/kr/	/l/	/r/	/l/	/fr/	/tir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
10	**Aki**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/r/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
11	**Aka**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
12	**KO**	/pl/	/p/	/b/		/t/	/j/	/j/	/g/	/k/	/g/	/w/	/f/	/θir/	/p/	/t/	/k/	/m/	/sn/	/sw/	/s/
13	**SM**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
14	**VM**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/s/
15	**AW**	/l/	/p/	/bl/		/tr/	/dr/	/fl/	/kr/	/gl/	/gr/	/fl/	/r/	/fr/	/sp/	/sp/	/sk/	/sm/	/sn/	/sw/	/fl/
16	**L**	/pl/	/pr/	/bl/		/t/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
17	**T**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dir/	/sp/	/st/	/sk/	/m/	/n/	/sw/	/sl/
18	**AK**	/pl/	/pr/	/bul/		/tir/	/dir/	/kil/	/kr/	/l/	/gir/	/fl/	/fr/	/θir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
19	**PM**	/pl/	/pr/	/bl/		/tir/	/dir/	/l/	/gil/	/l/	/r/	/fl/	/fur/	/dir/	/sp/	/st/	/sik/	/sim	/sn/	/sw/	/l/
20	**VB**	/pl/	/pr/	/bl/		/tr/	/d/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θir/	/sp/	/st/	/sk/	/sm/	/sin/	/sw/	/sl/
21	**JG**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/r/	/fl/	/fr/	/pr/	/sp/	/sk/	/sk/	/sm/	/sn/	/sw/	/sl/
22	**EW**	/pl/	/pr/	/bl/		/d/	/dr/	/kl/	/kr/	/gl/	/r/	/fl/	/fr/	/tir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
23	**BW**	/pil/	/pr/	/bul/		/tir/	/dir/	/kil/	/kir	/gil/	/gir/	/fl/	/fr/	/dir/	/sip/	/sit/	/sik/	/sim	/sin/	/sw/	/sil/
24	**JW**	/pl/	/pir	/bl/		/t/	/dr/	/kl/	/kr/	/l/	/g/	/fl/	/fr/	/θir/	/sp/	/st/	/sk/	/m/	/sn/	/sw/	/sil/

Appendix 21: Realization of consonant clusters at 4:0 -4:5 years

No.	Clients	Cluster consonants																		
		/pl/	**/pr/**	**/bl/**	**/br/**	**/tr/**	**/dr/**	**/kl/**	**/kr/**	**/gl/**	**/gr/**	**/fl/**	**/fr/**	**/θr/**	**/sp/**	**/st/**	**/sk/**	**/sm/**	**/sn/**	**/sw/**	**/sl/**
1	**BJ**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
2	**FM**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
3	**DK**	/pl/	/pr/	/bul/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dir	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
4	**DM**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
5	**PG**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/dl/	/dr/	/fl/	/fr/	/dir	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
6	**GC**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
7	**AK**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
8	**BM**	/pl/	/pr/	/bl/		/dr/	/tr/	/kl/	/kr/	/gl/	/g/	/fl/	/fr/	/dir	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
9	**SM**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dir	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
10	**TM**	/pl/	/r/	/bl/		/t/	/d/	/l/	/kr/	/l/	/gr/	/fl/	/fr/	/θir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
11	**JO**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
12	**IM**	/pl/	/pr/	/bl/		/tr/	/r/	/kil/	/kr/	/gl/	/gr/	/b/	/pr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
13	**SW**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
14	**XG**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
15	**MM**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
16	**FN**	/pl/	/pr/	/bl/		/tr/	/dr/	/gl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
17	**NC**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/tr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
18	**Pad**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/g/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
19	**SW**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
20	**PWai**	/pl/	/pr/	/bl/		/tir/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θ/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
21	**Paw**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
22	**GG**	/pl/	/pr/	/bul/		/dr/	/dr/	/kl/	/kr/	/gl/	/r/	/fl/	/fr/	/θir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
23	**PWa**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
24	**Gr**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	

Appendix 22: Realization of consonant clusters at 4:6 -4:11 years

No.	Clients	Cluster consonants																		
		/pl/	/pr/	/bl/	/br/	/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
1	HO	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
2	TO	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/thir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
3	BO	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/thir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
4	LK	/pl/	/pr/	/bl/		/tir/	/dir/	/kl/	/kir/	/gl/	/gr/	/fl/	/fr/	/thir/	/sp/	/st/	/sk/	/sm/	/sn/	/sit/	/sl/
5	SM	/pl/	/pur/	/bl/		/tir/	/dir/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dir/	/sp/	/st/	/sk/	/sm/	/sin/	/sw/	/sl/
6	BB	/pl/	/pr/	/bl/		/d/	/dr/	/kl/	/kr/	/gl/	/dr/	/fl/	/fr/	/dr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
7	DO	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/thw/	/sl/
8	AM	/pl/	/pr/	/bl/		/tr/	/l/	/r/	/kr/	/gl/	/g/	/fl/	/fr/	/thir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sil/
9	AA	/pl/	/pr/	/bl/		/t/	/dr/	/kl/	/kr/	/l/	/gr/	/fl/	/fur/	/dir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sil/
10	IM	/pul/	/p/	/bl/		/tur/	/dr/	/kl/	/kr/	/gul/	/gir/	/ful/	/pr/	/thir/	/sip/	/sit/	/sk/	/sm/	/sn/	/sw/	/sl/
11	AM	/pl/	/pr/	/bl/		/dr/	/dr/	/kl/	/kr/	/l/	/gr/	/fl/	/fr/	/tir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
12	S	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/dr/	/gl/	/g/	/fl/	/fr/	/dr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
13	EN	/pl/	/pr/	/bl/		/dr/	/dr/	/kl/	/kr/	/l/	/gr/	/fl/	/fr/	/dir/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
14	HW	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/l/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
15	AW	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
16	AMK	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
17	MY	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/b/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
18	EM	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/br/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
19	VM	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
20	GW	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
21	JB	/pl/	/pir/	/bl/		/tr/	/dir/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
22	SW	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
23	TM	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
24	MK	/pil/	/pr/	/bl/		/dr/	/dr/	/kl/	/kr/	/gl/	/dr/	/fl/	/b/	/dr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/

Appendix 23: Realization of consonant clusters at 5:0 -5:5 years

No.	Clients	Cluster consonants																		
		/pl/	**/pr/**	**/bl/**	**/br/**	**/tr/**	**/dr/**	**/kl/**	**/kr/**	**/gl/**	**/gr/**	**/fl/**	**/fr/**	**/θr/**	**/sp/**	**/st/**	**/sk/**	**/sm/**	**/sn/**	**/sw/**	/sl/
1	**EN**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
2	**LG**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θɪr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
3	**FI**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/g/	/gr/	/fl/	/fr/	/dr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
4	**CM**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/fr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
5	**CC**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θɪr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
6	**KO**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dɪr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
7	**PO**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
8	**JK**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
9	**M**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
10	**CA**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
11	**MM**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θɪr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
12	**SO**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θɪr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
13	**M**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
14	**TMu**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
15	**TMa**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dɪr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
16	**MS**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kɪr/	/l/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
17	**WA**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/pr/	/θɪr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
18	**PW**	/pl/	/pr/	/pl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/tri/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
19	**MMu**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
20	**MN**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/l/	/gɪr/	/fl/	/fr/	/θɪr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
21	**ZW**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
22	**AMa**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dɪr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
23	**EW**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θɪr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
24	**DB**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	

Appendix 24: Realization of consonant clusters at 5:6 -5:11 years

No.	Clients	Cluster consonants																		
		/pl/	**/pr/**	**/bl/**	**/br/**	**/tr/**	**/dr/**	**/kl/**	**/kr/**	**/gl/**	**/gr/**	**/fl/**	**/fr/**	**/θr/**	**/sp/**	**/st/**	**/sk/**	**/sm**	**/sn/**	**/sw/**	**/sl/**
1	**IN**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θɪr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
2	**AI**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
3	**WN**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θɪr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
4	**MW**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
5	**IS**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
6	**PO**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
7	**GS**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
8	**ES**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
9	**GC**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/dr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
10	**EK**	/pl/	/pr/	/bl/		/tr/	/dr/	/l/	/kr/	/l/	/gr/	/fl/	/fr/	/θr/	/sp/	/t/	/sk/	/sm/	/sn/	/sw/	/sl/
11	**HN**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sɪl/
12	**AK**	/pl/	/pr/	/bl/		/dr/	/dr/	/kl/	/kr/	/l/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/n/	/sw/	/l/
13	**C**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
14	**EM**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θɪr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
15	**YC**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
16	**FA**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/l/	/gr/	/fl/	/fr/	/tɪr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
17	**DG**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/l/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
18	**GO**	/pl/	/pr/	/bl/		/dr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/dr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
19	**MN**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
20	**SK**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
21	**JW**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
22	**CN**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
23	**SS**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/
24	**SO**	/pl/	/pr/	/bl/		/tr/	/dr/	/kl/	/kr/	/gl/	/gr/	/fl/	/fr/	/θr/	/sp/	/st/	/sk/	/sm/	/sn/	/sw/	/sl/