A developmental profile of speech sound and syllable acquisition in Zulu speaking children

Name: **Yugeshiree Naidoo**

Director of studies: **Prof. A. van der Merwe**

Co-director of studies: **Ms. E. Naude**

Submitted in partial fulfillment of the requirements for the degree of Master of Communication Pathology in the Faculty of Human sciences, University of Pretoria, PRETORIA.

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ABSTRACT

This study investigated speech sound and syllable development in eighteen Zulu speaking children, between the ages of 3;0 to 6;2. In addition, the frequency of occurrence of Zulu speech sounds and syllables in this age group was investigated. To elicit a representative sample of the subjects' natural speech, a 100-word spontaneous conversational sample was elicited from each subject. The samples were collected by a linguistically matched research assistant. All samples were transcribed phonetically by a stringent transcription procedure, and the reliability of the transcription was assessed by an external moderator. The UNIBET was used to code the transcription into computer recognisable symbols. The Phonetic Calculator Program (PCP) quantitively analysed the samples in terms of speech sound inventory, syllable inventory and the frequency of occurrence of speech sounds and syllables. The data was processed to allow for the comparison of the findings at three age levels namely, 3;0-4;0; 4;1-5;1 and 5;2-6;2. It was found that there was developmental progression between the ages of 3;0-6;2, with regard to speech sounds and syllables. It was found that much speech and syllable development occurred before the age of 3;0, and that the speech sound inventory and syllable inventory was incomplete by the age of 6;2. In addition, the nasals, plosives, approximants and fricatives were found to develop earlier than the affricates, clicks and prenasalised consonant sounds. The shorter syllable strings were found to develop earlier than the longer syllable strings. The subjects produced more speech sounds at an earlier age than their English-speaking peers. The subjects also produced longer strings of syllables at a younger age than their English-speaking peers. The findings in Group 1, Group 2 and Group 3 were similar to each other with regard to, the order of the speech sound frequency and syllable frequency. The more complex sounds and syllables were produced more frequently by the older subjects, demonstrating developmental progression. The findings have important clinical implications. Furthermore, the study can provide Speech-Language Therapists with a framework for further research, and contribute in constructing a relevant datab

ase of Zulu speech development.

KEYWORDS: Zulu; Speech development; Age groups; Sound inventory; Syllable inventory; Frequency of occurrence.

OPSOMMING

Hierdie studie het spraakklank- en lettergreep-ontwikkeling in agtien Zulusprekende kinders, tussen die ouderdom van 3:0 en 6:2 ondersoek. Die voorkomsfrekwensie van Zulu spraakklanke en lettergrepe in hierdie ouderdomsgroep is ook ondersoek. Om ‘n verteenwoordigende monster van elke proefpersoon se natuurlike spraak te verkry, is ‘n gesprek bestaande uit 100 woorde by elke proefpersoon ontlok. Hierdie monsters is versamel deur ‘n navorsingsassistent uit dieselfde taalgroep as die proefpersone. Alle monsters is foneties vertaal deur ‘n nougesette transkripsieprosedure en die betroubaarheid van hierdie transkripsie is deur ‘n eksterne moderator gemonitor. Die UNIBET program is gebruik om die transkripsie te kodeer na rekenaar-herkenbare simbole. Die “Phonetic Calculator Program” (PCP) het die monsters in terme van klankinventaris, lettergreepinventaris en die voorkomsfrekwensie van spraakklanke en lettergrepe kwantitatief geanaliseer. Die inligting is geprosesseer om toe te laat vir die vergelyking van die bevindinge by die drie ouderdomsgroepe naamlik, 3:0-4:0, 4:1-5:1 en 5:2-6:2. Daar is bevind dat daar ontwikkelingsprogressie ten opsigte van spraakklanke en lettergrepe tussen die ouderdomme van 3:0 en 6:2 was. Daar is ook bevind dat baie spraakklank- en lettergreepontwikkeling voor die ouderdom van 3:0 plaasvind en dat die spraakklank- en lettergreepinventaris steeds onvolledig was teen die ouderdom van 6:2. Daar is ook bevind dat nasale klanke, plofklanke, approksimante en frikatiewe vroeër ontwikkel as die affrikate, suigklanke en konsonante met voorafgaande nasalering. Daar is bevind dat die korter lettergreepstringe vroeër ontwikkel as die langer lettergreepstringe. Die proefpersone het op ‘n vroeër ouderdom meer spraakklanke as hulle Engelssprekende eweknieë gebruik. Die proefpersone het ook langer stringe lettergrepe op ‘n vroeër ouderdom as hulle eweknieë gebruik. Ten opsigte van die volgorde van spraakklank en lettergreep frekwensie, is Groep 1, Groep 2 en Groep 3 se resultate dieselfde gevind. Die meer komplekse klanke en lettergrepe is meer gereeld deur die ouer proefpersone gebruik, wat dui op ontwikkelingsprogressie. Die bogenoemde bevindings het belangrike implikasies.Die studie kan verder as ‘n raamwerk vir toekomstige navorsing onder Spraak-taalterapeute dien, asook bydra tot die konstruksie van ‘n relevante databasis vir Zulu spraakontwikkeling.

SLEUTELWOORDE: Zulu; Spraak ontwikkeling; Klankinventaris; lettergreepinventaris; frequency van voorkoms.

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1. INTRODUCTION

1.1 THE IMPORTANCE OF THE STUDY

Speech Therapists in South Africa are faced with the challenge of providing an equitable and appropriate service to a linguistically and culturally diverse population. There are numerous impediments to this challenge, most significantly, the lack of linguistically appropriate norms of speech development for all the languages spoken in South Africa, aside from English (Kunene, 1999). Languages differ in terms of the size and content of phonetic inventory, the phonotactic constraints of the language, the permissible syllable structures, and the phonetic complexity of the sounds. The norms of one language can thus not be applied to other languages. Language specific normative data is critical to Speech-Language Therapists, as it facilitates the differentiation between true speech-language pathology and speech-language difference. Without these norms, misdiagnosis and unnecessary or inappropriate treatment is likely. In addition to normative data assisting in identifying the presence or absence of a problem and making early and appropriate referrals possible, it facilitates the identification of goals and procedures for treatment, as these are usually based on developmental processes (Creaghead, Newman & Secord, 1989). There are undoubtedly precautions in the use of normative data on speech sound development, as individual differences must be recognised, and no child should be expected to perform on target at every prescribed age interval. These norms should therefore not be used as a measurement tool. This negative aspect does not detract from the fact that normative data on speech sound development, when used advisedly, is a useful guide in the identification and treatment of articulatory and phonological disorders. Success in our quest to provide an equitable and relevant service to all our patients, requires the groundwork of determining culturally and linguistically appropriate norms. Without these norms, deficiencies in the assessment tools and therapy programs will persist, and numerous speech disorders will continue to go unrecognised and untreated.

There is a paucity of normative data for most Southern African languages, one such language being Zulu. Research into speech-language disorders in Zulu speakers has historically been neglected. A number of factors have contributed to this condition, including, firstly, the fact that Speech-Language Therapy is a relatively new profession in KwaZulu-Natal and the culture of research is still being inculcated. Secondly, according to Statistics South Africa (2000) there are 1213 registered Speech-Language Therapists servicing a South African population of approximately 40,5 million people. The number of

registered Speech-Language Therapists includes those therapists currently not practicing in South Africa. From this it may be surmised that with the strenuous demands of clinical work, most therapists in practice have little time available to dedicate to research. Thirdly, normative studies are extremely rigorous and time consuming, and embarking on such studies requires dedication and resources (Groenewaldt & Musto, 1999). Fourthly, and most importantly, in this researcher's view, the vast majority of Speech-Language Therapists in South Africa are either English or Afrikaans speaking and have little or no proficiency in Zulu (Moodliar, 1994). Their ability to, and their confidence in embarking on research in Zulu, is thus diminished. In recent years however, in recognition of the importance of culture specific research, in maintaining our viability as a science based profession, a number of worthy postgraduate studies have been embarked upon, in many aspects of Zulu speech and language. These studies have focused largely on language acquisition and culture fair testing, for example, Bortz (1992), Rennison & Suzman (2000) and Solarsh (2000). There have been no published studies focusing on documenting the speech sound inventory, or the syllable structure inventory of Zulu speaking children. Only three unpublished undergraduate studies have been identified, which did focus on certain aspects of sound development in Zulu speaking children. These studies, while making a valuable contribution to the limited pool of data, were found to have methodological deficiencies, statistical limitations, and the findings had limited generalisability. In addition, significant comparisons between these previous studies and the present study could not be made, as the previous studies focused on different aspects of speech sound development, had different goals and different methodologies. These previous studies and their aims are discussed in more detail in section 1.4.

According to Fein (cited by Creaghead et al., 1989), articulation problems of various etiologies account for between 50% and 80% of all communication disorders. Furthermore, Morley (cited by Enderby & Davies, 1989) found that 14 % of five year olds had serious articulation defects. Unacceptably articulated speech, has been associated with poor social-emotional adjustment, and has had occupational and interpersonal effects in later life (Weiss, Gordon & Lillywhite, 1987). In addition, Fundudis, Kalvin & Garside (1979) also found that children, who had speech disorders that had resolved by the ages of six or seven, often had persisting literacy problems. Thus, the wide prevalence of articulatory disorders, as well as the long-term impact of these disorders, validates research into this sphere. When assessing the speech of an individual, the clinician is required to consider if the child's

speech development is behind the normal time schedule, whether his speech deviates from the norms of his language, and whether he uses a sufficient number of sounds as compared to his peers. The Speech-Language Therapist assessing a Zulu speaking child is not at present able to make any of these judgments confidently, because no norms of articulation development have been established for Zulu. Consequently, standardised articulation tests for Zulu speakers have not been established, and no articulation therapy programs have been adapted to Zulu. The documentation of the sounds in the speech sound inventory of normal Zulu speaking children, as well as determining the syllable inventory of normal Zulu speaking children, is an important prerequisite to formulating articulation tests and therapy programs. Furthermore, an account of the frequency that normal Zulu speaking children, produce specific speech sounds and syllables, will offer an indication of the effect of misarticulation of those speech sounds, or inability to produce a specific syllable structure, will have on the overall speech intelligibility (Shriberg & Kwiatkowski, 1982b). When a sound that occurs frequently in a specific language is misarticulated, the intelligibility of the speech is greatly diminished (Weiss et al., 1987). The severity of the speech handicap is directly related to the degree of unintelligibility.

In addition to normative data being useful in assessing the articulation of Zulu speaking children, it may provide the groundwork for further studies, such as the adaptation of the Speech Motor Learning (SML) program to Zulu. The SML program, developed by van der Merwe (1985), for the treatment of Apraxia of Speech (AOS), lends itself well to adaptation to other languages, by using the phonetic structure and phonotactic rules of the language in question. The goals, methods, and procedures of this program are directly aimed at treating AOS as a motor planning disorder, as current theory dictates it is (van der Merwe, 1997). The SML program has a simple presentation, carefully constructed nonsense units and imitative tasks, which highlights its potential for use as general speech facilitation program, or as a home program for children with delayed speech development, developmental apraxia of speech, and AOS (van der Merwe, 1997). This is necessary in a country such as South Africa, which has an insufficiency of trained professionals to formulate individualised exercise programs and home programs for each patient. The SML program once adapted to Zulu, will decrease the time required to formulate individualised therapy programs and home programs, and will be a valuable resource for therapists in

clinical practice. A prerequisite to the adaptation, is the documentation of the speech sounds and syllable structures used at different ages by Zulu speaking children.

1.2 STATEMENT OF THE PROBLEM

Reference has already been made to the importance of normative data, the lack of normative data of Zulu speech production, the high prevalence of articulatory disorders, as well as the lack of Zulu tests of articulation and Zulu therapy programs. These factors underscore the necessity of relevant research. However, the cost, time and logistics involved in embarking upon a normative study renders it beyond the capabilities of the present researcher. Instead, conducting a study that will offer normative indications is a realistic aim, and the findings would be relevant and useful in clinical practice, as well as in providing the groundwork from which further research can emerge.

The purpose of this particular study is twofold:

- To determine the speech sound inventory of Zulu speaking children at different age levels, and to determine how frequently these sounds are produced.
- To determine the syllable structures produced by Zulu speaking children as a function of age, as well as how frequently these syllable structures are produced.

1.3. SPEECH SOUND PRODUCTION

Numerous authors have attempted to define articulation. Creaghead et al. (1989) briefly described articulation as the actions of the organs of speech that modify the breath stream and thus produce the sounds of speech. More comprehensively, Weiss et al. (1987) used the terms articulation and phonology interchangeably, and described them as referring to "the production and perception of speech sounds in meaningful units and their rules mediated by the bodily systems and structures referred to as articulators". McWilliams, Morns & Shelton (1984), in their definition highlighted the interrelationship between articulation and language, which is emphasised by most authors on this subject. McWilliams et al. (1984) described articulation at a phonetic level, as being the movement of the articulators in modifying the air stream in a coordinated fashion, which results in speech production; and articulation at a phonological level, as the patterning of speech sounds and the phonemic contrasts that are used to express meaning.

From the definition of articulation, it is simple to surmise what an articulatory disorder is. An articulatory disorder may be regarded as a deviation from the complex patterns of

movements of the articulators, as accepted in a speaker's community (McWilliams et al., 1984). An articulation disorder would thus interfere with the speaker's communication, and cause him to draw undesirable attention to himself. Van Riper (1978) contends that communicative behavior can only be considered defective, if the said behavior deviates sufficiently from the norms and expectations of the subject's indigenous culture. This is particularly relevant to Speech-Language Therapists in clinical practice, whose prime objective is the accurate assessment and treatment of people with speech or language problems.

There are some broad universals as regards the order of speech sound acquisition. It is important to note that uniformity in the consonant inventory of a range of languages does not refer to the detailed phonology of an individual child (Vihman, 1993). Bearing this in mind, consider that Jacobson (1968) found that the first consonants acquired are usually /p/ or /m/, followed by /t/ and later /k/. He added that the first vowel to develop is /a/ followed by /i/ or /u/. Jacobson (1968) has been criticised in some instances for his prescriptiveness, as there is too much variation in terms of languages, individual variation between children, as well as variability within a child's speech, at any age level to form any firm and specific conclusions regarding a universal order of phonological development. However, there has been substantial agreement from numerous authors, including Hawkins (1995); Costello (1984); Hoffman, Schuckers & Daniloff (1989); Crary (1993) regarding elements of Jacobson's theories. There is agreement that vowels are the first sounds to develop, followed by nasals, then glides, then stops, then fricatives and lastly affricates. As regards the vowels, front vowels develop first and all vowels are usually acquired by the age of 2;6.

Some speech sounds and syllable sequences are common to many languages, and these sounds and sequences are labeled as more likely, or natural than others (Vihman, 1993). Sounds that are rare, or not common in many languages, are less natural and tend to develop later. The same would apply to sounds that are complex, or more demanding of the articulatory mechanism, for example, clicks (Bernhardt & Stemberger, 1998). According to Hawkins (1995) and Bernhardt & Stemberger (1998) the more frequently produced or more common a speech sound is in a specific language, the earlier it is mastered. These cross-linguistic frequency effects have been reported by Pye, Ingram & List (cited by Bernhardt & Stemberger, 1998). There are undoubtedly rules of articulation that are universal, partly because these rules are confined by the perceptual limitation of human beings, and the physiology of the articulatory mechanism, and central nervous system, at a given age

(Vihman, 1996). However, each language has a specific set of sounds, and permissible arrangement of these sounds in words, and rules regulating processes for adding, deleting or changing sounds, which is unique to the specified language. This negates generalisation between languages about speech sounds and syllable structures (Groenewaldt & Musto, 1999).

Over the years numerous investigators have been interested in determining the age at which children acquired the sounds of English, including Poole (1934); Templin; (1957); Prather, Hendrick & Kern (1975) and Sanders (1972). All of these researchers have used the elicited speech approach, for data collection (Smit, 1986). The elicited speech approach refers to speech samples of isolated words, being collected. There have been differences in their findings, regarding the age of mastery of English speech sound. These differing results have been attributed to differences in the methodologies, the researcher's individual definitions of acceptable responses, the researcher's criteria for age level mastery, different modes of speech sampling, different test stimuli, and differing transcription levels. While their findings in terms of the age of acquisition have differed, generally their findings as regards the order of acquisition, have been similar. They found that /m, n, h, p, w, b/ developed earliest, followed by /☠ & ♑ ♎ ♦ ♐ ♂ ● ♦ ❒/ and that /t♦ ❖ ⌘ ♎☪ ♦ ❄ 👎 ☪/ developed last (Sanders, 1972). Landmarks of English include, that the preferred place of articulation in early development, is labial, and this is followed by dental, alveolar and velar (Weiss et al., 1987). With regard to the most frequently misarticulated sounds of English, McDonald (cited by Weiss et. al., 1987) found these to be /♦ ⌘ ❒ ● ♦♦ ♎☪ ❄ & ♑ ♐ ❖/, while Weiss et al. (1987) found the most commonly misarticulated sounds to be /♦ ⌘ ❖ ●/ and consonant clusters.

1.4 SYLLABLE STRUCTURE DEVELOPMENT

Jacobson (1968) postulated a universal order of syllable acquisition. He indicated that the first syllable structure to develop was consonant vowel (CV) or CV reduplicated, followed by CVC and CVCV (where the consonant-vowel combination is different). In terms of English, it was found that CV, VC, CVC and two-syllable words, were expected by the age of two. By the age of three, English-speaking children are expected to produce CV, VC,

CVC, some word initial and word final clusters and bisyllabic words. By the age of four, in addition to the above, three syllable words are expected, more consonant clusters and word-initial and word-final consonant clusters in the same word. By the age of five, more than three syllable words are expected. By the age of six, all of the syllable structures should have been acquired by English speaking children (Shriberg, 1993).

According to Bernhardt & Stemberger (1998), there is a tendency for the less complex or more natural syllable structures to occur frequently in a language, and to be mastered earlier. In other words, there is a correlation between, the frequency of a syllable structure in a specific language, and how early that structure is acquired. According to Stockwell & Macaulay (1972) there are natural rules for preferred syllable structures. Stockwell & Macaulay (1972) highlighted that open syllable structures, for example, CVCV are preferred to closed structures, for example CVC. Preferred syllable structures also do not place vowel next to each other, and VCV would consequently be more natural. Furthermore, preferred syllable structures are opposed to consonants next to each other, and a vowel installed between two consonants, would thus be more natural.

Languages have varying syllable inventories, with some languages consisting of only CV syllables while others have extensive inventories including CV, CVC, CCVC, CVCC (Levelt, Schiller & Levelt, 1999). This fact again serves to highlight the inappropriacy of generalising from one language to another. No studies to date have been found in the literature, describing Zulu syllable structure as a function of age.

1.5 PREVIOUS RESEARCH ON ZULU SPEECH SOUND AND SYLLABLE PRODUCTION

The undergraduate research projects of Urcquart (1967), John (1988) and Kunene (1999) have contributed to the limited pool of data on Zulu speech development. However, the appropriacy of generalising their findings to the population, is limited by small sample sizes and methodological deficiencies. Urcquart (1967) investigated the speech acquisition of Zulu speaking children. The significant findings of her study include that nasals were the earliest to develop, followed by resonants, fricatives and clicks. The limitations of the study lie in the fact that the Zulu phonetic inventory utilised, is outdated and not in line with current developments in Zulu Phonetics and Linguistics. In addition, each speech sound was only assessed in one-word position, meaning, either word-initially or word-finally, and each speech sound was elicited once in a picture-naming task. Both these factors prevented

identification of variations in production. Furthermore, little attention was paid to limiting variables in subject selection and sample selection. John (1988) conducted a study aimed at describing the phonological processes present in the speech of Zulu speaking children. This study's major findings was, that weak syllable deletion, fronting, reversal of liquids, context sensitive voicing and stopping, are processes prevalent in the speech of Zulu speaking children between three and five years of age. The most common process was the fronting of alveolar and dental clicks. The finding that clicks are the last sound class to develop is supported by the findings of Urcquart (1967). John (1988), also utilised single-words as the sample, but a greater attempt was made to allow for more than one production of each speech sound. Of concern, was that certain consonant sounds were left out of the sample, as they did not occur frequently in Zulu, and more importantly, that Euro-American phonological processes were being applied to a language of which little was known. Moreover, insufficient attention was paid to controlling the confounding variables, which could have tainted the results obtained, and this influenced the reliability and generalisability of the findings.

More recently, Bortz (1992) was involved in a ten-year longitudinal study. One of the aims of the study is to collect information on the acquisition of speech and language, in various languages in the Johannesburg and Soweto area, with a view to establishing normative data. No details on the progress of this research could be obtained.

The most recent study, that of Kunene (1999), investigated speech acquisition in Zulu speaking children. The findings were that stops, liquids, glides, nasals and fricatives develop earlier than clicks and affricates. This was similar to the findings of Urcquart (1967). Surprisingly, Kunene (1999), found that all the Zulu speech sounds were mastered by the majority of her sample as early as age three, and only the speech sound /&☹/ was still marginal. By the age of four, all of the sounds had been mastered (Kunene, 1999). However, the sample consisted of sounds produced in isolated words, and thus no comment could be made on the manner in which these sounds were produced at conversational level. In addition, it was unclear whether all the words were elicited spontaneously, or whether some were elicited imitatively. This highlights the difficulty of comparing the findings of such studies to each other, as different researchers have different operational definitions, and different sampling and analysis techniques. The literature search did not reveal any studies regarding the syllable structures used by Zulu speaking children, or the frequency of sound and syllable production in Zulu speaking children.

1.6 GENERAL INFORMATION ON ZULU

Zulu is recognised as one of the eleven official languages in South Africa, and is one of the so-called "Nguni" group of languages, which also include Xhosa, Swathi and Ndebele (Poulos & Bosche, 1997). Zulu was the language of focus in the present study, firstly, because of the size of the Zulu speaking population and secondly, due to the scarcity of research involving Zulu subjects (Rennison & Suzman, 2000). According to Census 1996 (Statistics South Africa, 2000), Zulu is the most commonly spoken language in South Africa and is spoken by 22, 9 % of the South African population. In addition, Zulu is the first language of 79,8 % of the KwaZulu-Natal population (Statistics South Africa, 2000).

In the absence of relevant norms, empirical evidence suggests that it is common practice for South African Speech-Language Therapists, to inappropriately use English norms on Zulu speaking children. There are considerable differences between English and Zulu, namely: -

- the phonetic inventory of Zulu is much larger than that of English. English has a phonetic inventory of approximately twenty-four consonants and fourteen vowels (Weiss et al., 1987), while Zulu has 59 consonant sounds, according to the consonant chart utilised in the present study (appendix A), and seven vowels.
- Zulu has a unique click structure that does not occur in English (Cope, 1983).
- Zulu has no consonant clusters (Taljaard & Snyman, 1993), while English does allow for consonant clusters (Creaghead et al., 1989).

- All Zulu syllables are open (Poulos & Msimang, 1998), while in English both open and closed syllables occur (Cope, 1983).

- Zulu has a number of aspirated sounds differentiating meaning, and this is not a feature of English (van Rooy & Grijzenhout, 2000).
- Prenasalisation is a common feature of Zulu, but not of English (Cope, 1983).

The above differences are by no means exhaustive, but serve to highlight some of the important differences between Zulu and English, and the illegitimacy of generalising the norms of the one language to the other.

1.7 PHONETIC FEATURES OF ZULU

The field of Phonetics and Linguistics is in a constant state of flux, and research and debate into the phonetic structure of Zulu is vigorous (Bailey, 2002). The speech sound inventory of Zulu was of relevance to the present study in accurately transcribing the speech samples, as well as in comparing the subjects' sound production. The Zulu consonant chart (appendix A), utilised in the present study is based on the comparison by the current researcher, of the descriptions of various authors or phoneticians, including Poulos & Msimang (1998); Taljaard & Snyman (1993); Westerman & Ward (1990); Poulos & Bosche (1997); Doke (1967); Doke (1927); Cope (1983), Bailey (2002) and Lanham (1960). The consonant chart used is closely based on that of Poulos & Msimang (1998) and Westerman & Ward (1990). The conceptualisation of the prenasalised consonants, as separate consonants, was a specific contribution of Bailey (2002). An attempt was made to utilise the IPA classification, for maximal recognition internationally. The consonant chart was validated as adequate for the purposes of the present research, by the phonetics expert mentioned in the Methodology, and by a senior lecturer in speech sciences (Tesner, 2003). The description of the sound structure of Zulu, as accepted for the purposes of the present study is as follows: -

Consonant sounds:

In Zulu, there are two types of consonant sounds, namely plain consonants and clicks. According to Taljaard & Snyman (1993), the plain consonants consist of plosives, affricates, fricatives, approximants, nasals, and two consonant sounds that are unique to Zulu, which are the implosive /b/ and the partially voiced /k▒/. There is also a syllabic /m/ which results from a low level or superficial reduction of /❍◆/ to /❍/ (Bailey, 2002). The /r/ sound is not an integral part of Zulu phonology, is low frequency, and occurs only in words adopted or "borrowed" from other languages for example, English and Afrikaans.

Clicks

According to Westerman and Ward (1990), one seventh of all Zulu words have a click. There are three click positions namely, dental, palatal and alveolateral. There are voiceless

clicks, for example /i!a!a/, aspirated clicks, for example/◆🖫♒🏳🖫♒❑🖫♒❑/, voiced clicks, for example /isi!♑❑🙵▤❑/, nasalised clicks, for example /♓☠!♓■♎♓/, and prenasalised voiced clicks, for example /♓☠!g🏳■♎🏳/.

Affricates

According to Paulos and Msimang (1998), affricates are a more complex type of stop. In the production of affricates, there is air pressure build-up behind the closure, which is released slightly, causing audible friction. Thus, the initial element of the sound has a sharp plosive character, and this is followed by an element of audible friction. Examples of affricates in Zulu include /♦⬧/ ♋■♎ /🙵💻/, and prenasalised affricates include, /💣φ♐/ and /☠♦💻/.

Aspiration

According to Lephallo (1990), aspiration is a common feature of Zulu, and consists of sounds that are produced with “an extra puff of air” or an audible air current which forces its way through the vocal cords. Aspiration in Zulu causes phonemes to be contrasted in terms of meaning. In phonetic transcription, the aspiration is depicted by a small raised /h/, following the aspirated sound, for example, /❑♒/.

Breathy voice

This type of phonation is found in Zulu, Shona and Hindi, and is described as a situation where the vocal cords are relaxed, yet vibrating, combined with a whisper through the posterior portion of the folds (Ball & Rahilly, 1999). The feature of breathy voice, does not differentiate meaning, and was thus not recorded in the present study.

Prenasalisation

Prenasalisation refers to the phenomenon, where there is a momentary escape of air through the nasal cavity, before the raising of the velum and the build-up of air pressure, which is released at the lips. The momentary passage of air through the nasal cavity constitutes the prenasalisation, for example /☠♎⌘📭 ☠♎☹📭 ■♦⬧📭 💣φ♐/. The prenasalisation is not recognised as a separate speech sound, but rather, as a feature of the speech sound, (Bailey, 2002). In the current study, each of these prenasalised speech sounds was counted individually. In the phonetic transcription, all the prenasalised sounds are preceded by one of the following symbols /💣📭 ☠📭 ■📭 ❍/.

Syllabic /m/

Syllabic /m/, describes the bilabial nasal /m/ preceding the /u/, which is followed by either a bilabial, or a labiodental sound, becoming syllabic by the vowel being discarded. This occurs only in bisyllabic or polysyllabic stems, for example, umufundisi becoming /◆❍φ♐◆■♎♓♦♓/ (Lephallo, 1990).

Vowels

According to Westerman and Ward (1990), Zulu has a remarkably simple vowel sound inventory. There are five Zulu vowel sounds, indicated by the symbols /a, e, i, o, u/. The front vowels are /i, e/, the central vowel is /♋/ and the back vowels are /u, o/. However the /e/ and /o/ have two values, /e/ or /☜👍👍 and 👍□👍 or 👍⚐👍👍 which do not affect meaning, and are used according to vowel harmony (Poulos & Bosche, 1997). In the present study, the total number of vowel sounds, was documented as seven, in order to take the additional /☜/ and /⚐/, in to account. In Zulu, the length of the vowel does not distinguish meaning, and there are no diphthongs (Taljaard & Snyman, 1993).

Zulu syllable structure

Zulu syllable structure is simple compared to English. All syllables are open ended, meaning that they end in a vowel or a syllabic /m/. All Zulu words comprise one to nine syllables of the V, CV, VCV type (Poulos & Msimang, 1998; Poulos & Bosche, 1997; Doke, 1967; Lanham, 1960).

According to Doke (1967), and Ziervogel (1967), consonant plus /w/ and nasal consonant clusters are permitted in Zulu. However, in the last twenty years, the view on Zulu "consonant clusters" has changed, with phoneticians agreeing that there are no consonant cluster in Zulu, and are instead, identifying what Doke (1927) called clusters, as individual phonemes. Currently, phoneticians recognise that the labialisation, palatalisation, aspiration and prenasalisation that occurs in Zulu, is a phonetic feature of the specific consonant, not an independent phoneme, and is thus not a consonant cluster (Poulos & Msimang, 1998; Taljaard & Snyman, 1993; Lanham, 1960). Furthermore, these consonant sequences, behave phonologically as a single unit (Burton & Blumstein, 1992). An example of this phenomenon is the speech sound /mp/. This, in terms of Zulu, is referred to as a prenasalised consonant sound. It should be noted that, in the normal orthography, a single consonant sound may be represented by two or three different letters, for example /ts, kl,

♦♦♒🖃 ♦♒▭ ❍♐▭ ■♎▭ ■♎●▭ ■&♍▭ ♑❑▭ ■♒●/. In addition, in the phonetic transcription, a single consonant sound, may be represented by two or three symbols, for example, /&💻🖃 ☠🖫🖃 ☠♎☹/. According to Cope (1983) the phonotactic rules of Zulu oppose consonant clusters, so that even borrowed words have vowels installed between two or more consonants

1.8 THE PURPOSE OF THE STUDY

The purpose of the study was to provide an account of, firstly, the speech sound inventory of Zulu speaking children between the ages of 3;0 to 4;0; 4;1 to 5;1 and 5;2 to 6;2. Secondly, to determine the frequency of speech sounds, as a function of age. Thirdly, to determine the syllable structures produced by Zulu speaking children as a function of age. Fourthly, to determine the frequency of syllable structure production, as a function of age.

A vital prerequisite to conducting an adequate and appropriate assessment or effective therapy for Zulu speaking patients, is the establishment of normative indicators of speech development for Zulu. Speech-Language Therapists need to familiarise themselves with normal Zulu speech development in order to effectively analyse and diagnose disordered or delayed speech. The dire need for the accumulation of basic and statistical linguistic data for the African languages of South Africa is advocated by Groenewald & Musto (1999). At present, there is no account of Zulu speech development in the literature, that includes normal Zulu speaking children, between the ages of three and six, and that is based on samples of natural continuous speech. The use of primarily Euro-American norms of development on Zulu speakers is unsuitable, because it is incongruous to generalise between languages. The only viable solution to the existing problem is to create a separate database, for the documentation of normative indicators of speech sound and syllable development in Zulu speaking children, based on samples of continuous speech. A sample of continuous speech, refers to a sample obtained in a natural communicative, conversational setting. The validity of elicited speech data has been questioned by various authors including, Grunwell (1982), Smit (1986) and Creaghead et al. (1989). The main concerns being, that elicited speech, gained mainly by picture naming tasks, is not representitive of a child's spontaneous conversational speech, and that researchers' collecting elicited speech data often employ imitation. According to Smit (1986), children's imitative utterances have been found to be closer to the adult target than their normal non-imitative utterances, and this brings the validity of the findings into question.

Furthermore, elicited words, do not reflect the influence that adjacent words or sounds, have on each other in conversational speech, nor that a child may not produce a given sound in the same way in all phonetic contexts (Hawkins, 1995). The benefit of the elicited sample is that a sample of every speech sound can be guaranteed, whereas, in a continuous speech sample, the sounds produced by the child cannot be predetermined.

However, for the purposes of the present study, a sample of continuous speech is considered most suitable to be representative of the range and distribution of sounds in the subject's speech sound inventory. The validity, stability, and utility of conversational speech samples, for research in normal or disordered speech has been supported in a number of studies (Morrison & Shriberg, 1992; Shriberg & Lof, 1991; Shriberg & Widder, 1990). In addition, a sample of continuous speech was the only valid means of determining the frequency of occurrence of specific sounds and syllable structures. According to Creaghead et al. (1989), a sample of continuous conversational speech reflects the child's habitual speech production in actual communicative settings, and is thus the only true measure of articulatory proficiency.

2. METHODOLOGY

2.1 RESEARCH AIMS

Main aim

To determine certain specified features of speech development in Zulu speaking children, between the ages of 3;0 and 6; 2.

Sub – aims

The sub aims of the study were:

- to determine the speech sound inventory of Zulu speaking children, between the ages of 3;0 to 4;0; 4;1 to 5;1 and 5;2 to 6;2.
- to investigate the frequency of speech sounds produced as a function of age.
- to determine the syllable structures produced by Zulu speaking children, as a function of age.
- To investigate the frequency of syllable structure production, as a function of age.

2.2 RESEARCH DESIGN

Survey research was embarked upon, which allowed the researcher to describe the speech sound and syllable production of a specified group of Zulu speaking children. Survey research also allowed the researcher to present a description of the natural production of syllable structures, in a natural communicative setting. An important characteristic of this type of research, is that the researcher does not attempt to manipulate variables, but simply describes what exists (Mouton & Marais, 1990). This is dissimilar from experimental research, where the data is collected in the context of a controlled, laboratory environment, and subjects or circumstances are manipulated, to obtain specific responses. A survey design was useful, in terms of facilitating the generalisation of findings, by allowing for the employment of statistical analysis. A survey design was selected, to measure the characteristics of the sample at a point in time, in a cross-sectional approach, as opposed to a longitudinal one (Sproull, 1995). In addition, this design offered flexible guidelines, and thus allowed adjustments to be made within the study, depending on the results that

emerge. The survey design demanded a carefully chosen population, careful organisation, minimisation of bias, and systematic presentation of the data, which ultimately allowed, valid, generalisable conclusions to be drawn (Leedy, 1997). The data obtained was of a quantitative nature, therefore, statistical means were used to extract meaning, and interpret the findings. The initial transcription of the speech samples was conducted, utilising perceptual analysis, as this was the only appropriate means of recording the data, in a format that allowed the required data analysis and processing to be conducted. In the actual analysis phase, the software program utilised generated numerical data, which could be statistically analysed. The method utilised was thus, quantitative. Quantitative statistics was employed in determining the speech sound inventory of the subjects, syllable structures utilised, and the frequency of production, of specific speech sounds and syllable structures. In addition, quantitative measures were used for inter-group performance comparisons. Given that the sample size was relatively small, and thus difficult to generalise from, the researcher considered objective and explicitly controlled variables pivotal, to allow for maximal generalisability.

Stratified random sampling was utilised, which dictated that each unit within the target population needed to be identified, in order to ensure that each child had a positive chance of being chosen to be part of the sample. In order to comply with this, the pre-selection procedure described below, was embarked upon (Leedy, 1997). The categories were specified as the required age groups of the subjects. Within each category, the male and female subjects were separated. Equal allocation in terms of gender, within each category, or age group, irrespective of the number in the population, was decided upon. This was done to ensure that males and females were equally representation amongst the age groups. Within each category, simple random sampling was done, to prevent human bias. This method of stratified random sampling was selected, due to its precision, and that it allowed the researcher to control for the age variable. In addition, more detailed information about each age group could be extracted, and age groups could be compared. Furthermore, it allowed the researcher to utilise a relatively small sample, while maintaining representivity.

2.3 SUBJECTS

Criteria for the selection of subjects

- First language Zulu speakers: In order to be representative of the linguistic group being researched, all the children had to have Zulu as their first language, and have Zulu spoken in their homes and school.
- At least six subjects in each of the following age groups, 3;0-4;0; 4;1-5;1 and 5;2-6;2: It was decided that a sample size of eighteen, would be suitable for the purposes of the present research. The decision regarding the size of the sample was based on three factors. Firstly, eighteen children, from a possible forty-four were selected, as they met all the criteria. Secondly, the stratified random sampling method used, provided a sample, which, although small, was carefully selected to be representative (de Vos, 1998). Thirdly, in consideration of this being a master's study, the volume of data to be collected and analysed, and the time constraints, six subjects per age group, was decided upon as sufficient.

The age groupings made within the upper and lower age limit, importantly left no gap in development, and each group represented a twelve-month period of development. Similar developmental studies conducted on American English speakers, also utilised twelve-month intervals, for example, Irwin & Wong (1983), and Hoffman (1986). These age groups were selected, because of the volume of speech sound development that occurs, between the ages of 3;0 and 6;2. According to the consensus in the literature, the most rapid speech sound development occurs between two years of age and four years of age (Weiss et al., 1987; Costello 1984; Hoffman 1986). A lower age limit of 3;0 was set, as there is a high correlation between chronological age, and speech acquisition. There is great inter-child variability with regard to, the age at which specific speech sounds are acquired. However, most findings indicate that the early developing speech sounds are acquired by age 3;0. These include /. The following speech sounds are in the process of developing by 3;0, but have not been mastered, / (Creaghead et al; 1989). Another reason for the lower age limit of 3; 0 being selected, was to ensure that the required continuous speech sample, of 100-words could be achieved. Lowering the age limit, would have had a deleterious effect on the range, quality and size of the speech sample. The reason being, the ability to enlist the child's cooperation and participation, has

a major impact on the value of the data obtained. Children of 3;0, unlike younger children, are more cooperative, and able to construct sentences, and speak on a variety of topics. An extensive sample of conversational speech was thus feasible. An upper age limit of 6;2 was selected, because by the age of 6;2 most of the speech sound development will have occurred, according to the English norms of speech development (Hawkins, 1995). From the normative data on the phonetic development of American English speaking children, by the age of seven, the last developing speech sounds, namely, /❒▭ ♦▭ ⌘▭ ♦▭ ♦♦; ♎☪/, are acquired (Weiss et al., 1987). In addition, clinical significance was also a factor in the determination of the age group to investigate. Most referrals for speech and language assessment and treatment, are for children in the three to six year age group, and the findings of the current research would thus be useful. Another reason for the upper limit being set at 6; 2, was that all of the subjects were required to attend the same pre-school. Children older than the upper limit, tended to have entered Grade 1, and were no longer attending the target preschool. Furthermore, as the children become school aged, the exposure to English was greater, and this is a confounding variable, as indicated by the first criterion.

- Normal speech articulation: The subjects were required to represent children, with normal Zulu speech development. For this reason, all the subjects had to have normal speech articulation, as judged by their adult conversational partners. It is noteworthy, that those children classified as having normal articulation, did not necessarily have to have perfectly articulated speech. Rather, their speech patterns had to be considered, within the normal range for their chronological age. Thus, for the young children, the speech may have included specific types of deletions and substitutions. Information regarding the speech sound development of the subjects, was obtained from the teacher checklist (see appendix B), as well as the parent questionnaire (see appendix C) for the English version and (appendix D) for the Zulu version.
- Normal cognitive development: Speech development is an inseparable part of cognitive development (Creaghead et al., 1989). Inferior intelligence is known to impede articulatory and language development (Weiss et al., 1987). Only children considered by their class teacher to be of normal intelligence were considered (see appendix B).

- Age appropriate language development: Children with language problems are more likely to evidence articulatory and phonological problems, and delayed speech sound acquisition (Smit, 1986). Only children judged by the teacher, as having age appropriate receptive, and expressive language skills, were considered (see appendix B).
- Normal hearing: Hearing sensitivity is an important factor in the development of speech, because speech is stimulated or learned largely through hearing. Furthermore, hearing is critical for self-monitoring, auditory recognition, and auditory discrimination, of the distinctive features of speech (Weiss et al., 1987). Even cases of fluctuating hearing loss in children, as often occurs in children with chronic otitus-media, have reportedly been associated with delays in speech development (Smit, 1986). For this reason, only children with normal hearing were considered. This was prejudged via case history information, acquired from the parent or caregiver, (see appendix C). The parents or caregivers, were required to provide information about the child's medical history, relating to ear problems, and to offer a judgment regarding whether they considered their child's hearing to be normal. Normal hearing was confirmed by screening the hearing of all the subjects (refer to appendix E). Screening was conducted at 1000Hz; 2000Hz and 4000Hz. The children who did not respond to the signal at 25 dB, were eliminated from the sample group (Northern & Downs, 1984).
- Normal vision: Visual cues are one of the important cues, used by children in learning to articulate sounds. Thus, impaired vision could delay speech and language development. Only children judged by the teacher to have normal vision, were included (appendix B).
- Normal structure and function of oral anatomical structures: Abnormalities of the tongue, lips, mandible, soft or hard palate, dentition, pharyngeal muscles and vocal folds, have been associated with problems in articulation. The researcher thus performed an oral screening examination on all the potential subjects. The oral examination included, the assessment of the structural integrity of the lips, tongue, palate, and dentition. In addition, the function of the lips, tongue and soft palate, was screened (see appendix F). All subjects who failed the examination, were eliminated from the sample frame.

- A normally maturing body, with no anatomical abnormalities: All children with physical disabilities, resulting from, for example, cerebral palsy, hydrocephalus and meningitis, were excluded from the study. The incidence of speech and language problems, in children with physical disabilities is higher, than in children with normal physical development (Hawkins, 1995). This was an important criterion, as damage of the central or peripheral nervous system, often leads to generalised motor dysfunction, and an associated increased incidence of problems with the function of the speech mechanism (Creaghead et al., 1989; Costello, 1984). Information regarding the presence or absence of physical disability, was obtained from the parent questionnaire, because parents are most knowledgeable, as regards the development of their children (see appendix C for the English version and appendix D for the Zulu version). The teacher checklist (see appendix B), served to confirm the parent report. Any child identified as having a physical problem by either the parent or the teacher, was eliminated from the sample.
- No chronic illness or prolonged hospitalisation: Children who were reported to be chronically ill, for example, with viral diseases, frequent upper respiratory infections, recurrent ear infections, or who had had repeated hospitalization, or institutionalization, were excluded from the study. These factors are reported to have a negative impact on speech development (Creaghead et al., 1989). This information was obtained from the parent questionnaire (appendices C and D).
- Socio economic standing: According to Smith (1973), children from families with lower socioeconomic status, had more articulation defects than those from families with higher socioeconomic status. She attributed this to the higher income parents offering better models, paying greater attention to monitoring their children's articulation, and demanding a higher standard of output, earlier in the child's development. In order to control for these differences, all the children were selected from the same school, the population of which consisted of children from middle, to low-income families. Children from high-income families were not selected, as these children tended to attend English medium preschools, and were thus bilingual from an early age. They did not meet with the criteria regarding, exposure to other languages.

- Speech environment: This plays an important role in speech and language development. According to Vihman (1996), the kind of speech models the child is exposed to, as well as whether the environment is supportive of speech attempts, tend to influence speech and language development. The school was considered a good, stimulating environment, where the children met with good speech models. Therefore, only children who attended school regularly, were considered for inclusion in the study. This information was obtained from the teacher checklist (appendix B).
- Gender: According to Hawkins (1995), females tend to develop articulatory skills earlier, and more rapidly than males. An equal number of male and female subjects were selected, in order to control for this variable.

Procedure for the selection of subjects:

- Stratified random sampling was utilised, as described in the research design.
- A Zulu medium preschool, in a traditionally Zulu suburb of Pietermaritzburg, was purposefully selected to conduct the research in. The rationale for the selection of this school, were numerous. Firstly, the school was accessible to the researcher. Secondly, the children were being educated in Zulu, socialising in Zulu, were being raised in a Zulu language milieu, and were exposed to less English than the children attending more multiracial schools. The probability of obtaining a larger sample, fitting the sample criteria, was thus greater. Thirdly, the families in this area generally fitted into the middle to lower income category. The chance of gaining a larger sample, fitting the socio-economic criteria, was thus greater. Fourthly, the target population consisted of all the children, between the ages of 3;0 and 6; 2, enrolled at the preschool at the time of the data collection. This amounted to a total of 44 children. This was considered sufficient for the purposes of the present study.
- All the children were eligible to be subjects in the study, if permission was granted, and they met with the strict pre-selection criteria.
- A letter was written and submitted to the principal, requesting permission to conduct research at the school. A copy can be found in appendix G.
- All children not between the ages of 3;0-6;2, were eliminated.
- All children not having Zulu as their first language, were eliminated.

- The class teacher was then presented with this revised short list. As the class teacher was involved with the children for most of the day, she was considered a valuable source of information and insight. She was requested to eliminate from the shortlist, all the children whom she suspected of presenting, with any of the following problems: impairments of vision or hearing, cognitive delay, developmental delay, language delay, any physical disability, emotional immaturity and children with unstable family backgrounds, or poor school attendance. This was done, by presenting her with a checklist (appendix B) and the name list. The researcher was in attendance to answer questions, and offer clarification. As the teachers' impression of the child was required, it was explained, that she did not have to be certain of the existence of a specific problem, merely suspect it, in order for a subject to be eliminated. All the children identified by the teacher, as not fitting the criteria, were excluded from the list.
- Letters requesting permission from the parents or caregivers were typed in Zulu and sent home with the children. An English copy of the letter can be seen in appendix H, and a Zulu version can be seen in appendix I. A reminder was sent at the end of one week, to those parents who had not replied, to ensure minimum emergence of non-participation bias. At the end of the second week, all those children, for whom permission had been denied, and those for whom no response had been received, were eliminated from the short list.
- A questionnaire, in Zulu, was sent to the parents of the children, on the remaining shortlist. The detail on the content of the questionnaire is addressed under the heading, "Material". For the English version of the questionnaire see appendix C, and for the Zulu version, appendix D. Any child who did not meet the criteria, according to the parent or caregiver was eliminated from the list, except for those children with concerns regarding hearing. Since the teacher had not identified hearing difficulties in these children, they were allowed to proceed to the hearing-screening phase.
- All the subjects in the sample frame were subjected to a hearing screening. As recommended by Northern & Downs (1984), screening was conducted at 1000 Hz, 2000 Hz, and 4000 Hz. Subjects not responding to pure tones at 25 dB, failed the hearing screening, and were eliminated from the sample frame.

- An oral screening was conducted on the remaining children. A summary of the Orofacial checklist of Manson & Simon cited in Creaghead et al. (1989), was utilised as a screening tool. A copy can be seen in appendix F. All the subjects who failed the screening, were eliminated from the sample frame.

Description of the subjects:

Eighteen subjects were selected. Three age groups were established namely:

Group 1: 3; 0 – 4; 0

Group 2: 4; 1 – 5; 1

Group 3: 5; 2 – 6; 2

Table 1 indicates the subjects selected for the study, in terms of age and gender.

Table 1: Subject characteristics

Subject	Age	Gender
S1	3;1	M
S2	3;3	F
S3	3;10	F
S4	4;0	F
S5	3;4	M
S6	3;6	M
S7	4;4	F
S8	4;10	M
S9	4;9	M
S10	5;0	F
S11	5;1	F
S12	5;1	M
S13	5;4	M
S14	5;5	F
S15	5;8	M
S16	5;8	F
S17	5;9	F
S18	6;0	M

Abbreviations: M = Male; F = Female

Henceforth, the three age groups will be referred to as Group 1, Group 2 and Group 3. The reasons for the selection of the upper and lower age limits, have been discussed in the

section, "criteria for the selection of subjects". There were six subjects in each group. Each group had three males and three females.

Research assistant involved

A research assistant was necessary, as the researcher is not a first language Zulu speaker, and would thus have had difficulty engaging the subjects in, in-depth discussion. Furthermore, the researcher did not match the subjects culturally, and this was considered important in ensuring the comfort and compliance of the subjects. The role of the research assistant was to engage the subjects in conversation, and thus elicit the sample of continuous speech.

The research assistant was required to meet the following qualifications:

- A first language Zulu speaker: This was important because according to Mouton & Marais (1990), the cultural and linguistic differences between the researcher and the subjects, could have an inhibitory effect on the interview, and the performance of the subjects. A first language Zulu speaker was selected, firstly, to ensure that the children would be comfortable and thus more likely to provide a natural speech sample, and secondly, as the assistant would have to be able to engage the subjects in conversation on a variety topics, and obtain a representative sample of their natural speech.
- The assistant was required to be patient, caring, and adept at working with children. The experience of the research assistant, in enlisting the cooperation of the subjects, would directly influence the quality of the sample obtained (Smit, 1986).
- The research assistant needed to be professional, and disciplined, to ensure that the staff of the school were not inconvenienced, and that the data collection occurred efficiently.
- The research assistant needed to be trained, and experienced in the utilisation of toys as tools for building rapport, and as stimuli for speech elicitation.
- The research assistant needed to be trained, and experienced in speech elicitation techniques for example, forced alternative questioning, using declarative open-ended questions, the need to avoid yes/no questions, the importance of varying subject matter, and building rapport (Creaghead et al., 1989).

Description of the research assistant:

The research assistant selected was a twenty-seven year old, Zulu speaking female. She had worked as an assistant in the departments of Occupational Therapy, and Speech Therapy, at Grey's hospital, for approximately four years. While she had not had previous formal training at an academic center, she did have in-service training both in the departments of Occupational Therapy and Speech Therapy. The in-service training relevant to this research included, the handling of children at different ages and with various disabilities and personalities, routine Speech Therapy assessment and treatment techniques, problem solving and communication skills. She was experience in working, and interacting with the mainly Zulu speaking patient population in the hospital. She shared the cultural and linguistic background of the subjects. She was experienced in building rapport with children, and adjusting her communication to suit the situation and the personality of the child. The research assistant received specific training, from the researcher prior to the data collection, on techniques, including, commenting, forced alternative questioning, open-ended questions, sentence completion and the utilisation of play in speech elicitation (Creaghead et al., 1989).

Expert phonetician

The expertise of a phonetician was required to guide and support the researcher, who while having had undergraduate phonetic training and worked mainly with Zulu speaking patients, was not a first language Zulu speaker.

The expert phonetician should meet the following criteria:

- Post graduate training in general phonetics and linguistics.
- Possess expert knowledge on Zulu phonetics, and be able to offer relevant training regarding Zulu phonetics.
- Accessible to the researcher.
- Knowledgeable about the profession of Speech Therapy, and the type of research being conducted in this profession.
- Have teaching and research experience.

Description of the phonetician:

The Phonetics and Linguistics lecturer in the department of Speech Therapy-Audiology, University of Durban-Westville, was enlisted to assist in the study. The assistance included, updating the knowledge of the researcher on Zulu phonetics and transcription, assisting in the consolidation of an appropriate Zulu consonant chart, and the validation of

the transcription. The phonetician has a Masters degree from Natal University, in Zulu language and literature. In addition, he lectures first and second year Speech Therapy students on phonetic transcription, and has taught aspects of Zulu phonetics for 21 years (Bailey, 2002).

2.4 *ETHICAL CONSIDERATIONS*:

- Approval was obtained from the ethics committee of the University of Pretoria (appendix J).
- A letter was written and submitted to the principal describing the study, what was required of the school, the age and types of subjects that were being researched, and the potential value of the findings of the research. The researcher requested permission to conduct research in the school (see appendix G).
- A Letter requesting permission from the parents or caregivers was typed in Zulu, and sent home with the children. The letter described the study, assured confidentiality, and provided the name and contact details of the researcher, should the parent or caregiver be interested in the findings of the study. In addition, the letter indicated that if permission was granted a hearing screening and an oral examination would be conducted on the child. The parents were reassured that nothing invasive or harmful would be done to the child. It was requested that a response be sent within one week. For a copy of the English version of the letter see appendix H, and for a copy of the Zulu version of the letter see appendix I.

2.5 *MATERIAL*

A questionnaire for the parents

Aside from birth and developmental history questions, a yes or no format was utilised, to make the questionnaire as simple and expedient for the parent as possible. The questionnaire was utilised, to obtain information regarding the aspects that the teacher was unlikely to have had knowledge, and aspects that required confirmation. The questionnaire served to address whether the child met a number of criteria. The criteria included, Zulu first language, normal birth and developmental milestones, normal vision, normal hearing, no speech or language problems, no significant health problems at or since birth, no history of extended hospitalisation or institutionalisation. See appendix C for the English version of the questionnaire, and appendix D for the Zulu version.

Orofacial screening

The structural integrity of the lips, dentition, hard palate, soft palate, uvula, fauces, and tongue was screened. In addition, the function of the lips, tongue and soft palate was screened. See appendix F, for a copy of the screening form used.

A sample of continuous speech

A sample of continuous speech as described in the introduction, refers to a sample obtained in a natural communicative, conversational setting. The representivity of a continuous speech sample, is dependent on the sample being large enough, and sufficiently varied in content, to ensure that a given sound occurs more than once, in each word position. Grunwell (1982) recommends a 100-word sample at a minimum, and prefers 200 to 250-word samples. A 100-word sample size, was selected as adequate for the purposes of the present study, because a 100-word sample met with the recommendations of Grunwell (1982). Furthermore, the sample size was feasible to elicit from young subjects, and those who were shy, withdrawn or fatigued. It was also practical for the researcher and the school, as only two days could be allocated to data collection, with 35 minutes being allocated to each of the eighteen subjects.

Speech elicitation stimuli

Suggestions from Weiss et al. (1987) and Creaghead et al. (1989) were utilised as broad guidelines in the selection of age appropriate stimuli, to elicit a continuous speech sample. Furthermore, in acknowledgement of the importance of selecting culturally valid and relevant stimuli, the advice of the culturally matched teachers, and the research assistant was sought. Table 2 indicates the items selected for use in the data collection. According to the teachers and the research assistant, these were some items, which these children were exposed to at school and home.

Table 2: Speech elicitation stimuli

A doll and dolls clothing
A model house and furniture
A tea set
Toy farm animals
A low tech car racing set
Cooking utensils and dishes

Animal picture book
Action pictures depicting routine activities
Plastic food models

It is important to note that the above items served as stimuli, and not test material, and therefore did not require validation. The stimuli were required to encourage rapport, to allow for variation of the subject matter, to serve as topics of conversation, and to encourage play and interaction between the research assistant and the subject. Unlike test material, the stimuli were not utilised in eliciting specific words, or word structures, for scoring purposes.

Record sheets

While all the transcription would be done from the tape recording, record sheets were kept by the research assistant and the researcher, in order to document auditory and visual contextual cues, that had the potential to impact on the transcription of the samples (appendix K). The record sheets allowed the researcher to make notes on articulatory behaviors, that may not have been perceptible on the audio recording, for example, fricative distortions, or unusual facial gestures that accompanied sound production. In addition, the researcher could note other factors, that could have had a subtle effect on the recording, like the subject's general health and motivation.

Zulu consonant chart

At present there is no standard agreed upon consonant chart for Zulu. There is controversy regarding, the size of the inventory, the most appropriate symbols to use, the description of the sounds, the place of articulation, manner of articulation, the airstream and the representation of prenasalised consonant sounds. The number of sounds in Zulu consonant charts varies from phonetician to phonetician, from discipline to discipline, and from classification system to classification system. In addition, some of the consonant charts, were too descriptive, or detailed for the purpose of the present research. The researcher thus examined the published Zulu consonant charts, as described by numerous authors including Lanham (1960); Poulos & Msimang (1998); Taljaard & Snyman (1993); Cope (1983); Doke (1967) and Westerman & Ward (1990. The Zulu consonant chart utilised in the present study, was based on a combination of the consonant charts presented in Paulos & Msimang (1998) and Westerman & Ward (1990), and the advice of the expert linguist. The consonant chart utilised was simple, and yet comprehensive, and suited the purposes of

the current research. In addition, the importance of adhering to the International Phonetic Alphabet (IPA), so that the symbols used could be internationally recognised, was acknowledged (Ladefoged, 1990). The view of the sound structure of Zulu, adopted in the current study, treated all the prenasalised consonants as single sounds, and not consonant clusters or nasal compounds. For example, the slight nasal emission in the prenasalised stop, was not regarded as a separate phoneme, but rather as a phonetic feature of that consonant. The prenasalisation was depicted by, the addition of any of the following symbols, before a sound, /☠▱ 💣▱ ■/. The Zulu consonant chart, which was validated by the expert linguist, and a senior lecturer in speech sciences (Tesner, 2003), can be seen in appendix A. The consonant chart consists of 59 consonant sounds, and includes the normal orthographic symbol and its complementary phonetic symbol. In the section labeled, "notes on the table" (appendix A), eight additional prenasalised sounds, which were difficult to place in the table, were documented. These additional sounds, were supplemented with examples of words in which they occur, and were included in the 59 consonant sounds.

Chart of UNIBET equivalent symbols for Zulu

Details on the UNIBET can be found under the heading data analysis. The UNIBET provides for a limited list of standard symbols, for the conversion of the manually transcribed speech sounds, to computer keyboard compatible symbols. Zulu has a large consonant inventory, in addition, many sounds are unique to Zulu. For these reasons a few additional symbols had to be created, to be recognised by the software, during data analysis. Appendix L, shows the complete list of UNIBET symbols used, with their equivalent phonetic symbols, and the Zulu keywords. This list was compiled by the researcher, and checked by the person in charge of the Instrumental communication research laboratory, at the University of Pretoria.

2.6 *APPARATUS*

Apparatus for the collection of data

- A flashlight, examination gloves and tongue depressors, were utilised during the oral peripheral examination.
- A Madsen Electronics portable audiometer, was used for the hearing screening.

- The speech samples were recorded on a high quality Sony tape recorder, with an external lapel microphone. This was done to permit accurate transcription, repeat listening, and validation. In addition, attempting to transcribe a speech sample accurately, onsite would have been impractical, distracting to the subject and the researcher, as well as have impeded the desired natural interaction.
- High quality TDK cassettes were used in the recordings, to ensure the clarity of the recording.
- An electric energy source was utilised, to maintain constant recording quality.

Apparatus for the analysis and processing of data

- A basic personal computer and a standard keyboard. The windows operating system, and Microsoft Word software were utilised. In addition, Microsoft Excel, was used for the arrangement of the frequency data.
- The Phonetic Calculator Program (PCP), designed by Charles Musto, for the Department of Communication Pathology, at the University of Pretoria. The PCP is a user friendly, personal-computer compatible, windows based software program, which is utilised for the analysis, and quantification of the sound structure of any language (Groenewald & Musto, 1999). A complete description of how the program was utilised in the current study, can be found in the data analysis section.

2.7 *PROCEDURE*

Data collection procedure

Physical setting:

The sample was elicited in a quiet room on the school premises. The following preparations were made, to ensure that the room was conducive to speech sample elicitation:

- All potential distracters were removed from the room.
- Provision was made for the room to be well lit.
- It was ensured that an outlet was available for the tape recorder.
- An appropriately sized table, and three chairs were utilised.

- The room was arranged so that the research assistant and the subject sat together, with the researcher slightly away from them, so as not to negatively influence the rapport being developed, between the research assistant and the subject.
- The lapel microphone was secured to the child's clothing, ten to fifteen centimeters from the child's mouth, for a clear recording, with minimal distortion (Groenewald, 2000).
- An attempt was made to remove from the room, all clothing, jewelry, furniture or equipment with the potential to cause background noise.
- The researcher was in the room to monitor the tape recorder, to advise the research assistant if difficulties arose, to ensure that the speech sample size was achieved, and to record relevant contextual cues.

Sample elicitation procedure:

- The child was brought into to the room by the class teacher, and introduced to the researcher and the assistant. It was explained that we would be playing and talking for a little while. The research assistant established rapport with the child, by engaging in casual conversation, in the context of play. She was advised to open an avenue of discussion, and then follow the child's lead, as well as to frequently change the activity or topic. Topics introduced by the child were accepted, and encouraged.
- A comfortable, cheerful atmosphere was aimed for.
- The toys and material were presented individually, to prevent confusion and distraction.
- In addition to conversation about the toys and material mentioned earlier, continuous speech was elicited on some of the following topics: retelling of age and culturally appropriate stories, discussion of interests, experiences, family, sport, school and friends.
- Each activity or topic was maintained for three to five minutes, to ensure continued interest, and to facilitate the elicitation of a variety of different utterances.
- The child was given positive reinforcement for engaging in conversation, in the form of a pat on the shoulder, a smile, applause and verbal reinforcement.
- The duration of the session was approximately 35 minutes per child. If the required sample size was not achieved, and it was evident that the child was becoming

fatigued, an intermission was offered, in the form of going for a little walk or getting a drink of water.

Data recording procedure:

- Each speech sample was recorded on a TDK audiocassette.
- The record sheets (appendix K), were utilised to record comments and concerns that might have assisted, or guided the researcher in the transcription of the data.

Data Analysis procedure

- Perceptual analysis was the most effective and practical approach for the analysis of the speech samples. The researcher had had extensive training in phonetic transcription, at an undergraduate level. In addition, she had seven years of postgraduate, practical experience in the transcription of English, Zulu and Afrikaans. However, in order to comply with the high standard of transcription required for research purposes, the expert phonetician was enlisted to update and further train the researcher, in Zulu phonetic transcription. In addition, it was requested that he check the transcription of a specified number of samples, to establish validity and reliability of the transcription. The training and validation were important, as the researcher's exposure to pure Zulu transcription, was limited, and according to Creaghead et al. (1989) perceiving errors, and transcribing a language that is not your first language, is difficult, and requires vigilant listening and practice.
- As mentioned previously, the expert phonetician and Tesner (2003), assisted the researcher in finalising a Zulu consonant chart, which was appropriate for the purposes of the present study, to utilise in the analysis of the data (appendix A).
- The expert phonetician and the researcher, as part of the training, did the transcription of one randomly selected sample, together.
- The researcher then perceptually transcribed each speech sound in the remaining seventeen recorded samples. As mentioned previously, each sample consisted of 100-words. Every word uttered by the subject was phonetically transcribed, except for words that were inaudible to the researcher, due to fluctuations in the quality of the recording. Where the child habitually used the same word, for example, were he or she continually answered "yes", to many questions posed, this word was not recorded more than three times. This was done because the 100-word sample was

relatively small, and a variety of utterances, depicting the range and distribution of the child's speech sound inventory and syllable inventory needed to be gained.

- Only the consonant sounds and vowel sounds that were correctly produced, as compared to the typical realisation of the sound, by adult Zulu speakers, were documented. Sounds that were distorted, were omitted.
- Groenewald (2000) recommended, that ten percent of the total transcribed material be checked, in order to determine transcriber reliability. In view of the total sample consisting of 1800 words, 180 words constituted ten percent. Between 180 and 200 words from the total sample, were checked by the expert phonetician.
- The PHONASCII system, is a system developed for the computer coding of phonetic symbols. The phonemic alphabet of this system, is referred to as UNIBET. The UNIBET was selected by the researcher to code the manually transcribed speech sounds, into symbols that could be entered on to the computer, utilising the standard keyboard. The symbols used, could be recognised by the software package utilised in the data analysis. According to Allen (1988), the UNIBET system is internationally recognised, is based on the IPA, is easily learned, utilises the keys of the ordinary computer keyboard, and is inexpensive, as it does not require additional equipment or software. The UNIBET symbols are based on English dialects, and have equivalent symbols for the IPA. However, it does make provision for the addition of non-English speech sounds by devising new symbols. The UNIBET required that equivalent symbols be created, to match those of the Zulu consonant chart and vowel inventory. The researcher utilised the standard UNIBET symbols, where they corresponded to the Zulu consonant chart. Where there were no appropriate symbols for specific Zulu speech sounds, for example, /■♦🖃 &💻/, the researcher made use of the flexibility of the PHONASCII system, which allowed for the addition of default symbols. Furthermore, the researcher created additional UNIBET symbols, for each of the prenasalised sounds, which facilitated analysis. The additional or default symbols, included, ordinary letters of the alphabet in upper or lower case; numbers (keys zero to nine) and the symbols found on a standard keyboard, for example, (#; $; *; %). The complete list of the UNIBET equivalent symbols for Zulu, can be found in appendix L.

- Once each transcribed sound had an equivalent UNIBET symbol, the researcher manually translated each speech sound of the eighteen samples, to the equivalent UNIBET symbol. The eighteen samples were entered into Microsoft word, utilising the standard computer keyboard. Each sample was saved as a separate file, in order to facilitate expedient analysis of data.
- The transcribed data was sent via e-mail, to the Department of Communication Pathology, at the University of Pretoria.
- The person in charge of the Instrumental communication research laboratory, needed to add on the additional UNIBET symbols, that had been created, to ensure that the PCP recognised the symbols. This was done by clicking on the "symbols allowed" button on the program. This button called up a window, which contained the default UNIBET symbols. The additional symbols were then entered.
- All eighteen files were entered into the input section of the PCP.

Word count:

This function of the PCP was activated automatically when the text was entered into the input section of the program. The word count function, presented the number of words transcribed in each file, identified each symbol as a vowel or a consonant, counted the total number of vowels and consonants in each file, and the percentage of the vowels and consonants in each file. The count of the number of vowels and consonants, was important in calculating the cumulative totals for each age group.

Analysis of speech sound inventory:

A sound was considered present in the speech sound inventory, of a specific age group, when at least five of the six subjects produced the sound correctly, at least once in their speech sample. The "specific symbols" button, brought up the specific symbol results in a separate window. These results listed the number of occurrences of each sound, in each file, and calculated the percentage that the sound occurred, as compared to the total number of sounds in the file (Groenewald & Musto, 1999). The PCP provided the total for each subject.

Analysis of word structure:

Once entered into the PCP software package, the "word structure" button was activated, which automatically called up the word structure results, in a separate window. The PCP identified the specific structure of each word, in terms of sequences of consonants and

vowels, for example, CV, VC, and CVCV. The PCP counted the total number of different structures in each sample. The PCP determined each word structure, as a percentage of the total word count, in each file.

Data processing

As described in the data analysis section, the following information was gained from the analysis of the data, by the PCP. The number of words in each sample was counted, along with the identification of each symbol, as a consonant sound, or a vowel sound. The number of occurrences of each symbol in each speech sample, as well as the syllable structure in each sample, and the number of times each syllable structure, had occurred. This analysed data was then processed as follows, in terms of the sub-aims of the study:

Sub aim 1: To determine the speech sound inventory of Zulu speaking children at the ages 3;0-4;0; 4;1-5;1 and 5;2-6;2. The PCP listed all the sounds in each speech sample. The researcher grouped the subjects in terms of the predetermined age groups. Within the age group, one mark was allocated to each sound, for each subject that produced the sound correctly. This was irrespective of the number of times the sound had been produced correctly in the sample, or whether the sound occurred word initially, within word, or word finally. As mentioned previously, a sound was considered to be produced correctly, if the subject's realisation of the sound matched the typical adult Zulu realisation of the sound. Each sound, could thus be allocated a maximum of six marks, because there were six subjects in each age group. A specific speech sound was considered present in the speech sound inventory of a specific age group, if the speech sound was produced correctly, by at least five of the six subjects. This amounts to the sound being produced correctly by at least 83.33%, of the subjects, in each age group. A tabular representation was selected, to compare and contrast the speech sound inventories of the three age groups, as well as to compare the results with previous studies on English subjects, and previous studies on Zulu subjects.

Sub aim 2: To determine the frequently of speech sound production, as a function of age. As stated previously, the PCP analysis presented the number of times each speech sound was produced by each subject. In addition, the PCP presented the total number of consonant sounds and vowel sounds in each speech sample. In essence, the PCP provided the researcher, with a simple frequency distribution of each sound, for each subject. The researcher grouped the data in terms of the three age groups. All the data of the subjects falling into a specific age group, was counted together. As such, a grouped frequency

distribution (GFD), was used to summarise, compare and display the data. A GFD is compiled by grouping findings or scores. In the present study, grouping of data, in terms of pre-selected age groups, was done. The content of each GFD, is then placed in order, from high to low (de Vos, 1998). The number of times that each sound was produced, by each subject in a specific age group, was tallied. The number of consonant sounds and vowel sounds produced for each age group, was tallied. The mean score was derived, by dividing the total number of times a specific sound had occurred in a specific age group, by either the total consonant sounds for that age group or the total vowel sounds for that age group. The resulting figure was multiplied by 100, to form a percentage. The mean value effectively specified the centre of gravity, or balance point, and is described as the most stable and versatile measure of central tendency. Furthermore, the mean is widely used for statistical inference (de Vos, 1998). The sounds were then arranged, in tabular form, from most to least frequently produced, for each age group.

Sub aim 3: To determine the syllable structures produced by Zulu speaking children, as a function of age. The data generated by the PCP, included all the syllable structures that each subject had produced. The researcher grouped the findings into the three pre-specified age groups. A specific syllable structure was considered present, if it had been produced at least once, by at least five of the six subjects in the age group. These results were presented in tabular form, as a complete list of the syllable structures produced by the subjects ages, 3;0 to 6; 2. The presence or absence of a specific syllable structure, at a specific age level, was documented in the table, to allow for comparison amongst the three groups, as well as with previous studies.

Sub aim 4: To determine the frequency of syllable structures produced, as a function of age. The PCP analysis generated a simple frequency distribution, of the syllable structures used by each subject. This included for each subject, each syllable structure used, the number of times each syllable structure had been used, as well as the percentage of the total word count, that each syllable structure represented. In order to facilitate comparisons between age levels, the data was grouped into the three pre-specified age levels, to obtain a GFD (de Vos, 1998). The researcher added the number of times each subject in an age group, had used a specific syllable structure. The total word count was 600 for each age group, because each subject had produced 100 words, and there were six subjects within each age group. From this information, the mean score was calculated, to determine the average performance in each age group. This was done by dividing the total frequency of

occurrence, of a specific syllable structure, for each age group, by the total word count for that age group. This indicated the percentage of the total word count, the specific syllable represented. The mean was selected as the most reliable, or accurate measure of central tendency in the present research, which had a small sample size, because the results of every subject was represented and considered equally. The results were presented, from most to least frequently produced, at each age level, to allow for comparisons between the age groups. The graphic presentations utilised to illustrate the data, included, bar graphs and tables. These were selected, as they were visually effective, easy to interpret and, often used in the presentations of frequency distributions. These graphic presentations were ideal, in facilitating the comparison of the frequency distribution of one age group, to another.

2.8 DATA VALIDATION

As mentioned previously, the validity of the transcription had to be checked by the phonetics expert. Two hundred random words were sent to him for checking. He found two error types that the researcher had made. The misrepresentation of the allophonic vowels /ɱ/ for /ɐ̃/, and /ɒ̃/ for /ɒ̃/, had occurred twenty-four times. The misrepresentation of the voiceless plosive /k/ as the partially voiced plosive /ɡ/, occurred fifteen times. The researcher rechecked all the transcription of all the samples, in addition to the common errors highlighted by the phonetics expert.

3. DESCRIPTION OF RESULTS

The main aim of the present study was to ascertain specific features of the speech development of three groups of Zulu speaking children, between the ages of 3;0 and 6; 2. The main aim was achieved by means of four sub-aims. The sub-aims were, firstly, to determine which speech sounds were present in the speech of Zulu speaking children in groups one (3;0-4;0), two (4; 1-5;1) and three (5;2-6;2). Secondly, to determine the frequency of speech sound production from most frequently produced, to least frequently produced, as a function of age. Thirdly, to determine the syllable structures used by Zulu speaking children, as a function of age, and fourthly, to determine the frequency of production of syllable structures, from most frequently produced, to least frequently produced, as a function of age. This was done by collecting 100-word, spontaneous speech samples from eighteen children, between the ages of 3;0 and 6;2, and documenting the speech sounds and syllables produced by each subject, as well as the frequency of production of these speech sounds and syllables. Each sub-aim will be introduced and under each sub aim, the following aspects will be included: - a graphic presentation of the specific results obtained, and a description of the findings.

3.1 THE SPEECH SOUND INVENTORY OF THREE GROUPS OF ZULU SPEAKING CHILDREN, AGES 3;0-4;0, 4;1-5;1 AND 5;2-6;2.

An analysis of the speech sample was conducted to determine the sound inventory of each age group. Only the vowel sounds and consonant sounds that were produced correctly, were noted. The results of this sub aim are summarised in Table 3. As can be seen from Table 3, seven vowels sounds occurred in the speech of all three age groups, namely /□ □ □ □ □ □ □/. This is the complete set of vowel sounds that occur in Zulu (Cope, 1983; Doke, 1967; Poulos & Bosche, 1997).

With regard to the consonant sounds, there were two instances of developmental progression between the ages of 3;0 and 6;2. The production of the consonant sound /nt/ occurred in Groups 2 and 3, but not in Group 1. In addition, the consonant sound /□□□/ was produced by Group 3 only. In terms of the consonant sound inventory for Group 1, the subjects produced 32 of the possible 59 Zulu consonant sounds, which amounted to 54% of the sound inventory. In Group 2, the subjects produced twenty-eight of the 59 possible Zulu consonant sounds, which amounted to (47%) of the sound inventory. In Group 3, the subjects produced 31 of the possible 59 Zulu consonant sounds, which amounted to 52% of the speech sound inventory.

Table 3: **Speech sound inventory for each of three age groups, with reference to the manner of articulation**

Description	**3;0 – 4;0**	**4;1 – 5;1**	**5;2 – 6;2**
Plosives	□ ♦ & &□ □ ♦ & ♌ ♎ ♑	□ ♦ & &□ □ ♦ & ♌ ♎ ♑	□ ♦ & &□ □ ♦ & ♌ ♎ ♑
Fricatives	❖ ⌘ ☹ 💻 ♐ ⬧ ♦	❖ ⌘ ☹ 💻 ♐ ⬧ ♦	❖ ⌘ ☹ 💻 ♐ ⬧ ♦
Nasals	❍ ☠ ■ ■	❍ ☠ ■	❍ ☠ ■ ■
Affricates	&💻		
Approximants	● ◆ ♐	● ◆ ♐	● ◆ ♐
Implosive	♌	♌	♌
Prenasalised plosives	❍♌ ■♎ ☠ &	■♎ ■♦	❍♌ ■♎ ■♦ ☠&
Prenasalised affricates	☠♎⌘ ☠♎☹	☠♎⌘	☠♎⌘ ■♦⬧
Clicks	♋	♋	
Vowels	♋ ♓ ♌ □ ♏ ☚	♋ ♓ ♌ □ ♏ ☚	♋ ♓ ♌ □ ♏ ☚

A comparison of the speech sounds produced, shows that all the possible plosives in Zulu, /❒🖃 ♦🖃 &🖃 &🗏🖃 ❒♒🖃 ♦♒🖃 &♒🖃 ♌🖃 ♎🖃 ♑ / were produced by all three groups, so too, were seven of the nine possible fricatives /v; z; ☹; ♐▭ ⬩▭ 💻▭ 💧/. All the possible approximants /●▭ ⬥▭ ℯ♈/, three of the four possible nasals /❍▭ ■▭ ☠ / and two of the sixteen prenasalised consonant sounds /☠♎; ☠♎⌘/, were included in the speech sound inventory of all three groups. Furthermore, the implosive /b/ was included in the speech sound inventory of all three age groups. The affricate /&💻/ was recorded as produced by Group 1, but not Group 2 and Group 3. However, as speech is developmental in nature, and /&💻/ had been produced by Group 1, it may be anticipated that this production would also have occurred in the consonant sound inventory of Group 2 and 3. It is likely that there had been insufficient opportunity for /&💻/ to be produced in Group 2 and 3, for the sound to meet the criteria for inclusion. Note, that the additional five affricates that occur only with prenasalisation, were included as prenasalised consonant sounds and not affricates.

When the findings for Group 1 were compared to the Zulu consonant chart (appendix A), it was evident that the following consonant sound realisations were not present /ts; ♦💧▭ 🖫▭ ॐॐ▭ ॐ♒▭ 🖫♒▭ ॐॐ♒▭ ♎☪▭ ॐ♑▭ 🖫♑▭ ॐॐ♑▭ ✍▭ ♒▭ ☠ॐ▭ ☠🖫▭ ☠ॐॐ▭ ☠ॐ♑▭ ☠🖫♑▭ ☠ॐॐ♑▭ 💣 ♌❖▭ ☠♎☪▭ ❍❒▭ ■♦▭ 💣φ♐▭ ■♦⬩▭ ☠♦💧▭ ☠♦💻/. It is significant to note that of the twenty-seven consonant sound realisations not in the consonant sound inventory of Group 1, fourteen (52%) were clicks. There are fifteen possible click consonant sounds in Zulu, including the three prenasalised clicks, and Group 1 had one included in its inventory, namely, /ॐ/. Of the twenty-seven consonant sound realisations not in the consonant sound inventory of Group 1, eight (30%) were prenasalised consonant sounds (prenasalised plosives, prenasalised affricates and prenasalised fricatives), namely, /💣 ♌❖🖃 ☠♎☪🖃 ❍❒🖃 ■♦🖃 💣φ♐🖃 ■♦⬩🖃 ☠♦💧🖃 ☠♦💻/. The rest of the consonant sounds lacking in the inventory of Group 1 were three affricates /♦⬩🖃 ♦💧🖃 ♎☪/, and two fricatives / ✍, h/.

When the sound inventory of Group 2 was compared to the Zulu consonant chart (appendix A), it was evident that the following consonant sounds had not been realised /♦⬩▭ ♦💧▭ &💻▭ 🖫▭ ॐॐ▭ /♒▭ 🖫♒▭ ॐॐ♒▭ ♎☪▭ ॐg▭ 🖫g▭ ॐॐg▭ ✍▭ ♒▭ ■▭ ☠ॐ▭ ☠🖫▭ ☠ॐॐ▭ ❍♌▭ ☠ॐg▭ ☠🖫g▭ ☠ॐॐg ▭ ☠♎☹▭ ☠♎☪▭ ❍❒▭ ☠&▭ 💣φ♐▭ 💣 ♌❖▭ ■♦⬩▭ ☠♦💧▭ ■♦💻

/. Of the 31 consonant sounds not in the inventory of Group 2, seventeen (55%) were found to be clicks. In Group 2, as in Group 1, /ॐ/ was the only click produced. Of the 31 consonant sounds not in the consonant sound inventory of Group 2, ten (32%) were prenasalised consonant sounds, namely, /mb, 💣 ♌❖,☠♎☪📫 ☠♎☹📫 ❍❑📫 ☠&📫 💣φ♐📫 ☠♦⬩📫 ☠♦♠📫 ☠♦💻/. The remaining consonant sounds not in the inventory of Group 2, were four affricates /ts📫 ♦♠📫 &💻📫 ♎☪/ and two fricatives, /☟📫 ♒/. However, as indicated before, it is highly likely that /&💻/ is in the consonant inventory of all three groups, for developmental reasons.

The comparison of the consonant sound inventory of Group 3, to the Zulu consonant chart (appendix A), indicated that the following consonant sounds were not produced, /ts; ♦♠🖃 &💻 🖃ॐ🖃 🖫🖃 ॐॐ🖃 ॐ♒🖃 🖫♒🖃 ॐॐ♒🖃 ♎☪🖃 ॐ♑🖃 🖫♑🖃 ॐॐ♑🖃 ☟🖃 ♒🖃 ☠ॐ🖃 ☠🖫🖃 ☠ॐॐ🖃 ☠ॐ♑🖃 ☠🖫♑🖃 ☠ॐॐ♑🖃 💣 ♌❖🖃 ☠♎☪🖃 ☠♎☹🖃 ❍❑🖃 💣φ♐🖃 ☠♦♠🖃 ☠♦💻 /. On inspection of the results, it was found that, of the twenty-eight consonant sounds not produced by Group 3, eighteen (64%) were clicks. No clicks were produced by Group 3, unlike Group 1 and Group 2, which both had the click /ॐ/ in their consonant sound inventory. However, as indicated previously, because speech is developmental in nature, and the sound /ॐ/ had been produced in the younger age groups, it is highly likely that it would also occur in Group 3. It is likely that there had been insufficient opportunity for the consonant sound to be produced, for it to meet the criteria for inclusion. The same would apply to /■📫 ❍♌📫 ☠&/ which was evident in Group 1 and Group 3, but not in Group 2, and /☠♎☹/ which occurred in Group 1 but not in Group 2 and Group 3. Of the twenty-eight consonant sounds lacking in the consonant sound inventory of Group 3, seven (25%) were prenasalised consonant sounds, namely /💣 ♌❖, ☠♎☪📫 ☠♎☹📫 ❍❑📫 💣φ♐📫 ☠♦♠📫 ☠♦💻/. Aside from the clicks and the prenasalised consonant sounds, also excluded from the consonant sound inventory of Group 3, were four affricates /♦⬩📫 ♦♠📫 &💻📫 ♎☪/ and two fricatives /☟📫 ♒/. As indicated previously the affricate /&💻/ was evident in the consonant sound inventory of Group 1, and for the reasons mentioned, is highly likely to be represented in the inventory of Group 2 and 3.

3.2 THE FREQUENCY OF SPEECH SOUND PRODUCTION AS A FUNCTION OF AGE

In the frequency analysis for each age group, the number of times each subject in a specific age group produced a certain speech sound, was tallied. Based on these individual scores, group means were computed. The group means allowed for a comparative study of the frequency of speech sounds produced by the three age groups. These group means were arranged from most to least frequently produced. The findings for Group 1, Group 2 and Group 3 are depicted in Table 4.

The results, with regard to the frequency of vowel sound production, indicated that the order of frequency of vowel production, was the same across all three age groups. In all three groups, /a/ was the most frequently occurring vowel, followed consecutively by /♓ ◆ ☜ ♘ ♏/ and /o/. The vowels were intermingled with a few consonant sounds, but the order was constant, and all of the vowels in all three age groups occurred high up the order in terms of frequency, more frequently than 1,91% of the sample.

Table 4: The frequency of occurrence of Zulu speech sounds, from highest to lowest, in subjects between the ages of 3;0 and 6;2

3;0 - 4;0 (Group 1)		4;1 - 5;1 (Group 2)		5;2 - 6;2 (Group 3)	
Speech sound	**FOO %**	**Speech sound**	**FOO %**	**Speech sound**	**FOO %**
ꕥ	19.43	ꕥ	17.84	ꕥ	16.97
ꕤ	13.21	ꕤ	12.05	ꕤ	13.11
◆	8.06	◆	7.62	◆	7.76
ꕢ	6.31	ꕢ	6.70	ꕢ	6.47
●	5.00	■	4.90	ꕣ	4.55
■	4.30	●	4.65	⬩	4.52
ꕣ	4.07	ꕣ	4.35	●	4.41
❍	3.59	⬩	3.74	■	4.11
⬩	3.48	❍	3.30	ꕒ	3.18
ꕒ	2.74	ꕞ	3.16	❍	2.82
ꕟ	2.66	ꕟ	2.65	ꕟ	2.80
⬩	2.54	ꕒ	2.65	ꕞ	2.74
ꕡ	2.40	ꕡ	2.30	ꕦ	2.14
ꕞ	2.38	ꕦ	2.12	ꕡ	2.11
◆	1.73	□	2.00	⬩	1.98
ꕦ	1.50	⬩	1.81	□	1.92
⌘	1.41	⌘	1.74	◆	1.70
□	1.33	ꕦ	1.38	ꕦ	1.67
□	1.20	ꕦ	1.33	ꕦ	1.62
ꕦ	1.13	◆	1.33	⌘	1.18
ꕡ	1.05	□	1.09	□	1.12
ꕦ	1.02	ꕡ	1.06	♦	0.98
💻	0.96	♦	1.06	■ꕤ	0.93
♦	0.96	☹	0.90	ꕘ	0.85
♦	0.90	➶	0.76	💻	0.82
☹	0.82	♦	0.74	☹	0.79
ꕘ	0.76	ꕘ	0.74	➶	0.77
■ꕤ	0.65	■ꕤ	0.50	ꕡ	0.74
ꕤ	0.62	ꕞꕤ⌘	0.50	♦	0.58
➶	0.60	💻	0.50	◆ꕡ	0.49
■	0.60	ꕤ	0.48	ꕞꕤ⌘	0.41
ꕞꕦ	0.60	■♦	0.45	ꕤ	0.38
ꕞꕤ⌘	0.45	❖	0.42	❖	0.37
ꕛ	0.40	◆ꕡ	0.35	■♦	0.33
ꕞꕤ☹	0.37	ꕛ	0.32	□	0.30
■♦	0.34	■	0.32	ꕤꕪ	0.30
◆ꕡ	0.34	ꕞꕦ	0.32	ꕛ	0.27
❖	0.31	🖫ꕘ	0.29	■	0.27
□	0.25	🖫	0.24	ꕟ	0.19
🖫ꕘ	0.14	ꕟ	0.21	ꕞꕛ	0.19
ꕞꕛ	0.14	□	0.21	■♦⬩	0.16
ꕤꕪ	0.14	ꕢ	0.16	◆□	0.16
ꕢ	0.14	ꕞꕤ☹	0.13	🖫	0.14
ꕛꕛ	0.11	ꕞꕛ	0.13	🖫ꕘ	0.14
ꕛ	0.11	ꕤꕪ	0.13	♦♦	0.11
ꕞꕤꕪ	0.08	ꕞ🖫	0.08	ꕛꕛ	0.11
🖫	0.08	ꕛꕛ	0.08	ꕞꕤꕪ	0.08
■♦⬩	0.06	◆□	0.08	ꕛ	0.08
◆□	0.06	♦♦	0.08	ꕛꕘ	0.08
❍φ➶	0.06	■♦⬩	0.05	ꕢ	0.05
♦♦	0.03	ꕞꕤꕪ	0.05	ꕞꕤ☹	0.05
ꕟ	0.03	ꕞ♦💻	0.03	◆φ➶	0.03
		❍φ➶	0.03	◆ꕡ❖	0.03
		ꕛ	0.03	🖫	0.03
		ꕛꕘ	0.03	ꕞ🖫	0.03
		ꕛꕛꕘ	0.03		
		ꕞꕛꕛꕘ	0.03		

Abbreviation: FOO = Frequency of occurrence

In general, the results revealed that all three groups shared the same top four most frequently produced consonant sounds, although in differing orders, for each group. These top four

consonant sounds were /l, n, m, s/. In Table 4, the frequency of speech sound production in Group 1, shows that /a/ features as the most frequently produced speech sound (19.43%). In fact, the top four most frequently produced speech sounds were found to be the vowels (♋▭ ♓▭ ◆▭ ☜). The most frequently produced consonant sound was found to be the approximant /l/ (5.0%), and the least frequently produced consonant sound was found to be the voiceless fricative /h/ (0.03%). Interestingly, the consonant sounds more frequently produced tended to be mainly, approximants, nasals, fricatives and plosives. However, those produced less frequently, with a mean frequency of less than 0.30% tended to be the affricates, clicks and the prenasalised consonant sounds. The exceptions being the voiceless fricative /h/ (0.03%), the voiced fricative /✍/ (0.14%), and the plosive /p/ (0.28%), which also occurred lower down the order.

Group 2 frequency findings as seen in Table 4, showed that the vowel sound /a/ again featured as the highest-ranking speech sound (17.84%). Furthermore, as in the case of Group 1, the four speech sounds, occurring most frequently were in fact vowels /♋▭ ♓▭ ◆▭ ☜/. The most frequently produced consonant sound was the nasal /n/ (4.9%), while the click /☠ॐॐ♑/ was the least frequently produced, with a mean frequency of (0.03%). As with Group 1, the consonant sounds occurring lower down the order were found to be affricates, clicks and the prenasalised consonant sounds. The only other consonant sounds occurring lower down in the order, below 0.30%, were the voiced fricative /✍/ (0.16%) and the voiceless fricative /h/ (0.21%). As with Group 1, the nasals /❍📭 ☠📭 ■📭 ■/, approximants / ●📭 ℯ𝓇📭 ⬥/, implosive /♌/ voiceless fricatives /♐📭 ⬥📭 💧📭 💻/, plosives /♌📭 ♎📭 ♑📭 ❑📭 ❑♒📭 ⧫📭 ⧫♒📭 &📭 &♒📭 &🗏/, affricates /⧫⬥📭 &💻/, and the voiced fricatives /❖📭 ⌘📭 ☹/, were found to be more frequently produced, between 0.42% and 4.90%.

The results of the frequency analysis for Group 3 is depicted in Table 4, and shows that the vowel sound /a/ which was produced 16.97% of the time, was the most frequently produced speech sound in this age group. The least frequently produced consonant sound was the click /☠🖫/, which was used 0.03% of the time. The top five most frequently produced speech sounds were the vowels /♋📭 ♓📭 ◆📭 ☜📭 🏱/. The most frequently produced consonant sound was the voiceless fricative /s/, with a mean frequency of 4.52%. A similar pattern as that of Group 1 and Group 2 emerged, in that all the speech sounds lower down the order, below 0.30%, were affricates, clicks and prenasalised

consonant sounds. The only exceptions to this were the voiced fricative /ɸ/ (0.05%), the voiceless fricative /h/ (0.19%) and the nasal /■/ produced 0.27% of the time. Higher up the order, between the frequency of 2.36% and 4.52%, were the following categories of consonant sounds: voiceless fricatives, approximants, and nasals. Between the mean frequencies of 2.14% and 0.31 %, were a number of plosives, approximants, voiced fricatives and prenasalised plosives.

3.3 THE SYLLABLE STRUCTURES USED BY ZULU SPEAKING CHILDREN AS A FUNCTION OF AGE

A syllable structure analysis was conducted, to determine which syllable structures the subjects in the three age groups were capable of producing. This was done irrespective of whether or not the target consonants and vowels were correctly produced, or whether the target word was realised correctly or not. A syllable structure was considered present in the syllable inventory of the age group, if the said structure was produced at least once by five or more of the six subjects in the age group. The results of this analysis are displayed in Table 5. This table displays for each age group the presence or absence of a specific syllable structure. The list of syllable structures provided, are those that occurred at least once in any of the eighteen speech samples.

Overall, it was found that all three groups were capable of producing one to five syllable words of the CV and VC type (see Table 5). Group 1 and Group 2, did not produce six or seven syllable words for example, CVCVCVCVCVCV, VCVCVCVCVCV or VCVCVCVCVCVCV. While Group 3 had one of the six-syllable word structures in its syllable inventory, seven and more syllable structures were not included in the inventory. Words consisting of CV were not documented as present in any of the three age groups, as these words had not been produced by five or more of the subjects in each age group. CV was produced by four subjects in Group 1 and three subjects each in Group 2 and Group 3.

Table 5: The syllable structures produced by Zulu speaking children between the ages of 3;0 and 6;2

Syllable structure	Group 1 3;0 – 4;0	Group 2 4;1 – 5;1	Group 3 5;2 – 6;2
VCVCV	+	+	+
VCVCVCV	+	+	+
CVCV	+	+	+
CVCVCV	+	+	+

VCVCVCVCV	+	+	+
CVCVCVCV	+	+	+
VCV	+	+	+
CVCVCVCVCV	+	+	+
CV	-	-	-
CVCVCVCVCVCV	-	-	+
VCVCVCVCVCV	-	-	-
VCVCVCVCVCVCV	-	-	-

Plus (+) indicates: syllable structures present in the syllable inventory of the age group.
Minus (-) : syllable structures absent from the syllable inventory of the age group.
Abbreviations: V = Vowel; C = Consonant

3.4 THE FREQUENCY OF SYLLABLE STRUCTURE PRODUCTION AS A FUNCTION OF AGE.

In this analysis, the frequency of occurrence of each syllable structure used by each age group, was calculated by adding every individual frequency and dividing this total by the total number of words, to determine the mean. This was expressed as a percentage, and arranged in an order of highest frequency to lowest frequency. The findings of the frequency analysis for each age group are depicted in Figures 1, 2 and 3. These figures display for each age group the syllable structures that were produced, as well as the mean frequency percentages.

The results indicated that the most frequently produced syllable structure in Group 1 and Group 3, was VCVCV, with a mean average frequency of 29,33% and 26,0% respectively. The most frequently produced syllable structure in Group 2, was CVCVCV, with a mean average frequency of 22,83%. The following structures featured commonly as the four most frequently produced structures in all three groups, VCVCV; VCVCVCV; CVCV and CVCVCV.

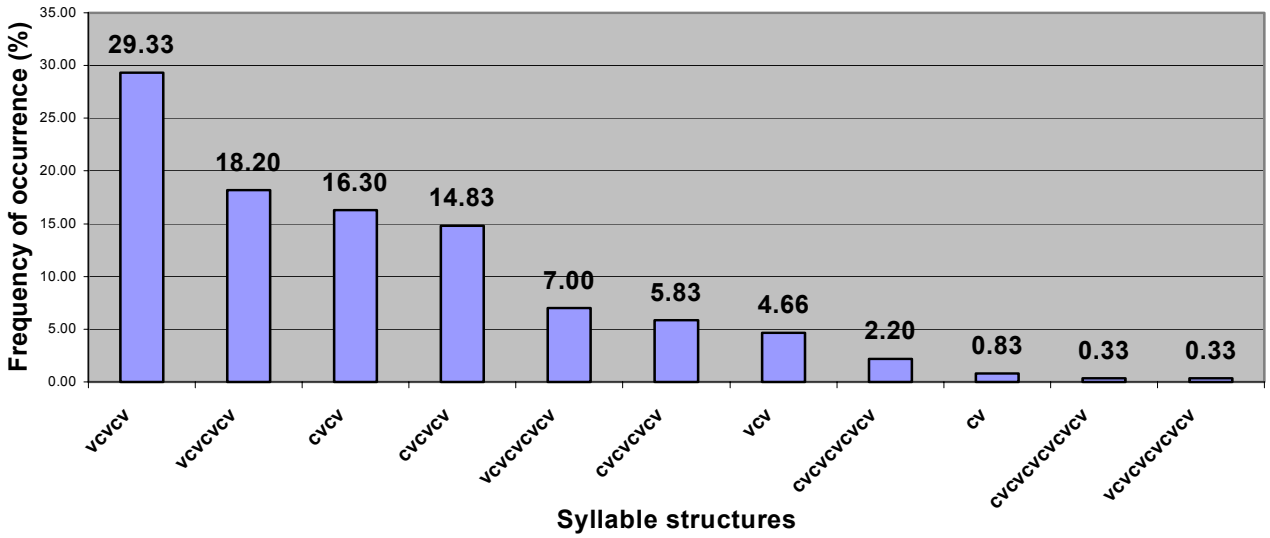

Figure 1: The frequency of occurrence of syllable structures from highest to lowest in subjects between the ages of 3;0 - 4;0 (Group 1).

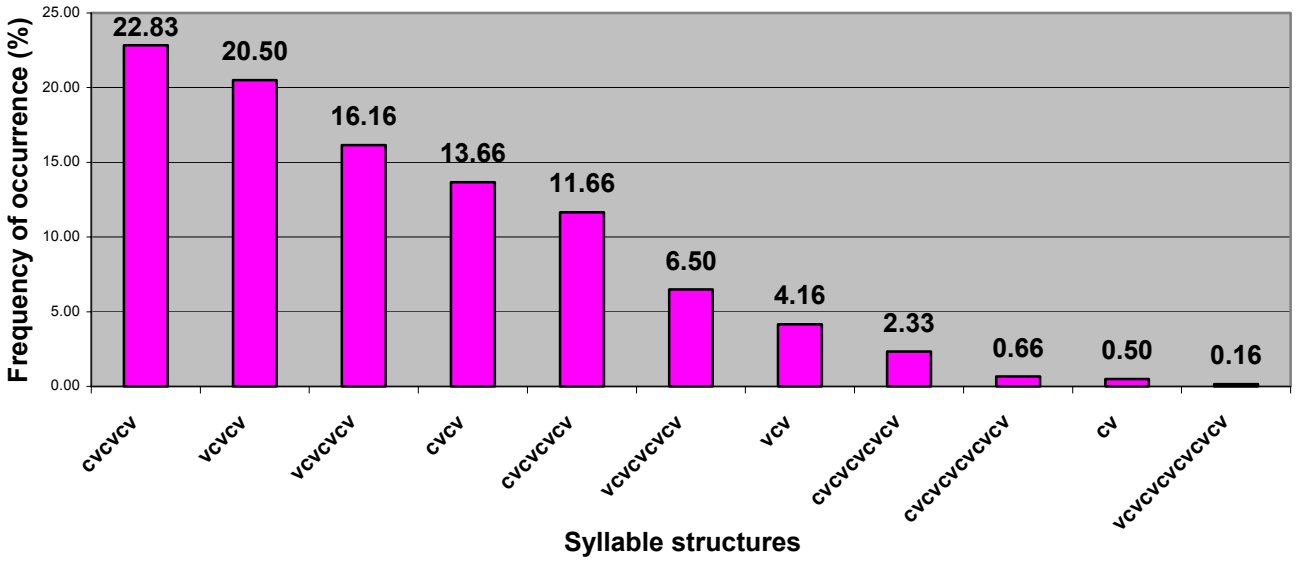

Figure 2: The frequency of occurrence of syllable structures from highest to lowest in subjects between the ages of 4;1 - 5;1 (Group 2).

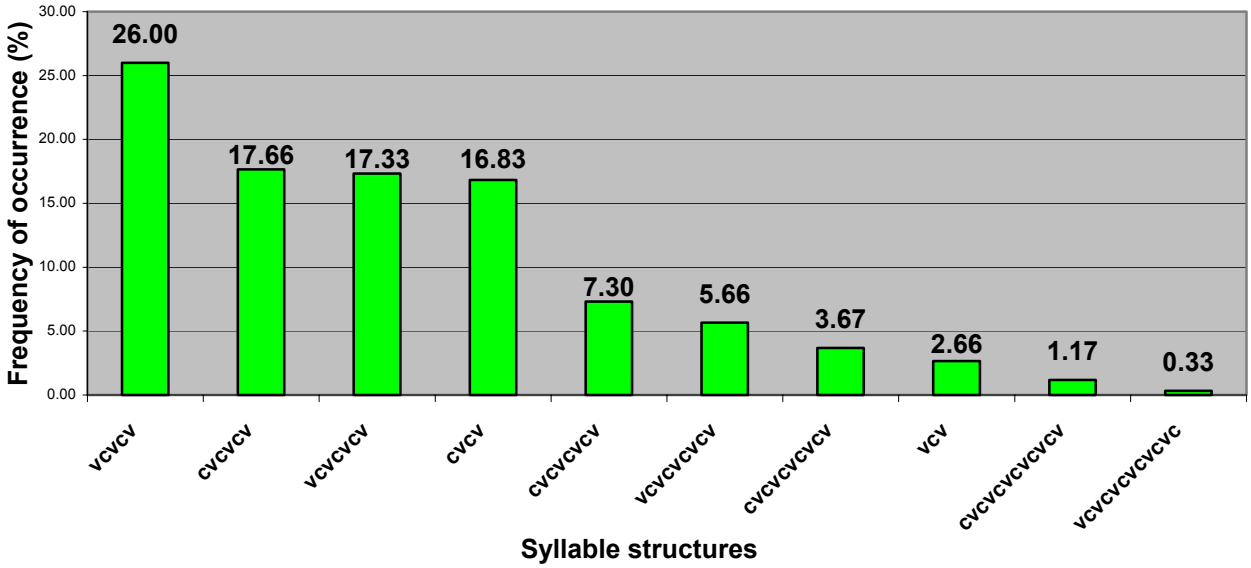

Figure 3: Frequency of occurrence of syllable structures from highest to lowest in subjects between the ages of 5;2 - 6;2 (Group 3).

A further perusal of the frequencies in percentage of these four structures, highlighted that they were similar across all three age groups, and occurred significantly more frequently than the rest of the structures. The top four structures, ranged from 13.66% to 29.33%, with most structures occurring more frequently than 15.0% in all three groups. The frequency scores for the rest of the structures were in the 0.16% to 11.66% range, with most falling below the 5.0% level. The most frequently produced syllable structures consisted of shorter strings of CV and VC structures, for example, CVCV and VCVCV. As the length of the strings of CV and VC structures increased, the frequency of production decreased. This phenomenon was present in all three age groups. The only exception being, the phonotactically simple VCV and CV structures, which tended to occur further down the order of all three age groups, below a mean average of 5,0%.

4. DISCUSSION

4.1 SPEECH SOUND DEVELOPMENT IN ZULU SPEAKING CHILDREN

The finding of the present study, that complete vowel sound development occurs before age three, is supported by the findings of the three unpublished studies, on Zulu speech sound development (John, 1988; Urquhart, 1967; Kunene, 1999). This finding is also supported by the literature on English speech sound development, and the universal findings on the general order of speech sound development, which indicate that all the vowels should be achieved by 2;6 (Templin, 1957; Otomo & Stoel-Gammon, 1992; Irwin & Wong, 1983). Furthermore, Zulu has a simple five-vowel system and no diphthongs (Doke, 1927; Poulos & Msimang, 1998; Lephallo, 1990), and this too, supports the finding of the vowel system developing early.

With regard to the consonant sound inventory of Group 1, Group 2 and Group 3, the results indicate that all three groups produced approximately 50% of the consonant sounds included in the adult Zulu phonetic inventory. By the age of 6;2 the subjects had achieved 52% of the required consonant sounds, and as these are normally developing children, it is anticipated that the remaining 47% would follow the normal developmental pattern, and be mastered after the age of 6;2. As highlighted earlier in the text, there were a few sounds that were present in the inventory of Group1 and Group 2, but not in Group 3. As speech is developmental in nature, it is highly likely that these sounds had not been produced, due to lack of opportunity, and not lack of ability. The percentage of acquired sounds is thus likely to be slightly higher than the 52% indicated above. Evidently, between the ages of 3;0-6;2, gradual change in terms of the speech sound acquisition occurs in these subjects. The speech sounds that are acquired between the ages of 3;0-6;2, are the prenasalised plosive /■♦/ and the prenasalised affricate /■♦♦/. This developmental progression, clearly indicates that speech sound development is occurring, and being integrated into the sound system of the subjects between the ages of 3;0-6;2. Further evidence of developmental progression is also noted in the frequency of occurrence of speech sound data, of all three groups (see Table 4). Some of the subjects are able to produce a wider range of the speech sounds than others. The criterion of five or more of the subjects producing a sound, in order for it to be documented as acquired was, however, not met. It is thus clear that in Zulu children, much speech sound development occurs before the age of three, is maintained and developmental progression occurs. The rest of the speech sound inventory develops after the age of 6;2, as speech development is a continuous process (Bernhardt & Stemberger, 1998). The current findings indicate that twenty-eight additional consonant sounds, need to be achieved by Group 3. All the speech sounds present in the 3;0-6;2 inventory, aside from /■♦♦🖃 ■♦/

develop before the age of 3;0. However, in the present study, the number of opportunities the subject has to produce the sound, is not measured or documented. This fact makes it difficult to conclusively label a specific speech sound, absent from the speech sound inventory of a subject. The PCP does not provide for the calculation of the number of opportunities for a specific speech sound. The nature of a spontaneous continuous speech sample is such that, the number of opportunities for production of a speech sound, cannot be prescribed as in an elicited naming sample, where a sample of every sound can be ensured. The only provision that could be made, and was made, was to attempt to gain a large and varied sample, which would allow for many opportunities for the production of each speech sound. The finding of a relatively small consonant sound inventory in all three age groups, may have been influenced to some degree by the lack of opportunity for the production of more consonant sounds. Some of the consonant sounds not documented in the inventory of 3;0 to 6;2 age group, may have been too low frequency, to have been found in a 100-word speech sample. Given that the complete Zulu consonant inventory, of 59 sounds, is larger than that of English inventory, of twenty-six consonant sounds, Grunwell's (1982) guideline of a 100-word speech sample, may in retrospect, have been insufficient in the present study, in offering the subjects ample occasion to produce more sounds. However, a larger sample would be difficult to obtain, and would still not guarantee a complete inventory of speech sounds. Perhaps a complementary study utilising elicited naming tasks will be of more value. The strict criterion of five out of six subjects producing the sound for inclusion in the speech sound inventory, also limits the inventory, as shown by the frequency of sound production findings, which indicate that many of the subjects are producing certain sounds that are not documented as acquired. This strict criterion was necessary to support the contention of mastery.

According to the findings on universal speech development by Jacobson (1972), vowel sounds develop earliest, followed consecutively by nasals, glides, stops, fricatives, and affricates. Group 1 is able to produce all the possible vowels, nasals, plosives and approximants, which indicates that they develop before the age of three, and were thus early developing sounds. This early development of certain classes of sounds is supported by Jacobson (1972). Group 1 is able to produce all the required nasals, approximants and stops, but is not able to produce two of nine possible fricatives and three of the four affricates, which supports the finds of Jacobson (1972), that certain classes develop later.

Studies on speech sound development in American English speaking children, are rarely in agreement. The most stable and often quoted data appears to be that of Sanders (1972), which

was a reinterpretation of the findings of Templin and Wellman et al. According to Sanders (1972), /❍□ ■□ ♒□ ◘□ ♦□ ♌□ ☠□ &□ ♑□ ♎□ ♦/ are expected to develop before the age of three. This is the case with the subjects of the present study, except for the fricatives /h/ and /ɸ/ which are not yet documented as acquired by Groups 1, 2 or 3. The subjects in Group 1, in addition to the above sounds, are able to produce /ॐ□ &▤□ ◘♒□ ♦♒□ &♒□ ♌□ ❖□ ⌘□ ☹□ ♐□ ♦□ 💻□ ♦□ ☠□ ■□ ●□ ℯ□ ❍♌□ ■♎□ ☠♎⌘□ ☠♎☹□ ☠&/. According to Sanders (1972) additional sounds that are acquired between the ages of 3;0 and 4;0, are /♐□ ℯ□ ●□ ♦□ ❒/. Aside from the /r/ which is not part of the Zulu phonetic inventory, the subjects in Group 1 of the present study, are able to produce all of the above sounds. According to Sanders (1972) children between the ages of four and six acquire the sounds /❄□ 👎□ ⌘□ ❖□ ♦□ ☪□ ♦♦□ ♎☪/. In the present study, the fricatives /⌘□ ❖□ ♦/ are already acquired by Group1, while the affricates /♦♦□ ♎☪/ are still not documented as acquired by Group 3. /❄ □ 👎□ ☪/ are not part of the Zulu phonetic inventory. Group 1, in the present study appears to be able to produce a bigger range of consonant sounds, than their English-speaking counterparts. In terms of speech sound type, it is interesting to note that the least produced class of sounds in all three age groups, are the clicks and prenasalised consonant sounds. This is an expected finding as these sounds require complex articulatory adjustment, and are uncommon in other languages. According to Stockwell & Macaulay (1972), sounds that are rare and require complex articulatory adjustment tend to develop later and are sounds that are prone to misarticulation.

With regard to the previous findings on Zulu speech sound development, Urcquart (1964), found that the first sounds to develop are nasals, followed by resonants, fricatives, and clicks. John (1988) agreed that clicks occur last. According to Kunene (1999), early to develop are stops, liquids, glides, nasals, and fricatives, while clicks and affricates develop later. There is agreement between these earlier findings and the present study, in that it is found that plosives, nasals approximants and fricatives develop early, and that affricates and clicks develop later. However, Kunene (1999), also claims that all sounds were acquired by four years of age, and that the Zulu speaking three year olds only had /&💻/ to master. This is contrary to the current findings, as described earlier. The difference may lie in the fact that the current study relies on spontaneous conversational speech as opposed to elicited words, which were used in the previous studies. There are significant differences between the present study and the previous studies, in

terms of the methodology and definition of terms, and this may account for some of the difference in the findings. The differences in the methodology and definition in terms, makes attempting a closer comparison between the studies difficult and erroneous. It is important to note that the previous studies did not consider the category of prenasalised consonants.

These findings are of value from a clinical point of view. In clinical assessment, the findings can assist in estimating approximately how well a child's speech sounds are developing, as compared to normal children of his or her age group. This will influence the decision as to whether treatment is necessary or not. Furthermore, in clinical treatment of Zulu speaking children with articulation problems, developmental apraxia of speech, and adults with apraxia of speech, these early developing speech sounds of normal speakers, can be used as targets. A more comprehensive selection of targets can be gleaned by utilising the results of the frequency of speech sound production analysis.

In each age group, the frequency of sound production data, indicate the sounds that are more frequently produced than others. With regard to the frequency of vowel sound production, the finding that the order of frequency that the vowel sounds are used in, is the same across all three age groups, highlights the stability of the findings. The high frequency of vowel sound realisations, as compared to consonant sound realisations is an expected finding in a Zulu sample, as the syllable structure of the language is vowel intensive, with no word final consonants and consonant clusters (Poulos & Msimang, 1998). Furthermore, Hawkins' (1995) contention that motorically less complex sounds, for example vowel sound, occur more frequently, is supported by the present findings. The researcher examined the findings on frequency of vowel sound production in English speaking children, in Weiss et al. (1987), and recorded those vowel sounds that were common to Zulu, in their order of frequency. The order of frequency in the English speaking subjects is /♓♋ ♋♋ ☜♋ ♌♋ ◆♋ ♏♋ □/, as compared to /♋♋ ♓♋ ◆♋ ☜♋ ♌♋ ♏♋ □/ which is the order of frequency in the Zulu speaking subjects. Clearly, while the order is not exactly the same, there are similarities in the findings. In both the English and the Zulu subjects, the vowel sounds /e, o/ are the least frequently produced of the vowels, and /i, a/ are the most frequently produced of the vowel sounds.

The findings for all three age groups, with regard to the order of frequency of consonant sounds, are similar. In fact, the top five most frequently produced consonant sounds for Group 1 and Group 3 are the same, although in a different order, namely, /●♋ ■♋ ❍♋ ♦♋ ♐/. Group 2 is the same as the other two groups in terms of the top

four positions / n, l, s, m/, but /☠/ replaced /j/ in the fifth position, and /j/ took sixth position. There is thus agreement across the three age groups on the most frequently produced consonant sounds. In addition, of significance, is that a cumulative total of the frequency, of the top six consonant sounds in each of the three age groups, amounts to more than 20%. The frequency of occurrence of speech sounds in a specific language has major influence on the speech intelligibility (Weiss, 1987). If a speech sound with a high frequency of occurrence is deleted, or misarticulated, the impact on the speech intelligibility is greater than if a sound with a low frequency of occurrence is deleted, or misarticulated. The adequacy of articulation is based largely on two factors, the number of speech sounds acquired, as well as the overall intelligibility.

Shriberg & Kwiatkowski (1980), studied the frequency of intended American English consonant sounds in continuous speech, and found that /n/ was the most frequently occurring sound, followed consecutively by /♦ ♦ ❒ ♎ ❍ ⌘ 👎 ● & ♦ ♒ ♌ ◘ ♑ ♐ ☠ ♏ ❖ 💧 ❄ ♎☪ ☪/. There are a few commonalities with the Zulu subjects in the present study, in that the consonant sounds /♎☪ ❖ ◘ ♐ ♑ / also occurred infrequently in the Zulu subjects (less than 1% of the time). However consonant sounds like /♏ ☠/ which occurred infrequently in English, occurred frequently in Zulu (more than 2,2% of the time in all three age groups). Therefore, while there are similarities between the frequency of consonant sound production, between English and Zulu, there are also significant differences, and frequency findings appear to be relatively language specific. There are no studies on the frequency of Zulu speech sound production, to which the current findings could be compared.

The clinical implication of the frequency of speech sound production finding, is that it would be advisable to consider the high frequency consonant sounds, as possible targets for treatment, as their impact on intelligibility is greater (Weiss, 1987). Furthermore, according to Hawkins (1995), the more frequently a speech sound occurs in a language, the less motorically complex it is. This again endorses the importance of, first selecting, as targets for therapy, those sounds that are produced more frequently by children with normal articulation.

4.2 SYLLABLE STRUCTURE DEVELOPMENT IN ZULU SPEAKING CHILDREN

What emerges from the data, is an indication that the shorter syllable structures, namely, those consisting of one to five syllables, are acquired before the age of 3;0-4;0, and are maintained by

the older age groups. The only exception is, that the structure CV is not documented as acquired by any of the three age groups. It is unlikely, that the lack of this simple structure, in the spontaneous samples, is due to the subjects being incapable of producing the structure. It is more likely, that the lack of this structure in the samples is because, this structure occurs infrequently, as a word in the Zulu language (Doke, 1967; Cope, 1983). The opportunity for the subjects to utilise this structures is thus limited. The only developmental progression found is CV duplicated six times, in Group 3.

Zulu speaking children appear to be using longer strings of syllables at a younger age than English speakers. According to the findings of Hoffman (1986), and Shriberg (1993), English speakers are not expected to use three or more syllable word shapes by the age of 3;0, as much syllable reduction occurs below the age of three. With the Zulu speakers, much of the syllable development appears to occur before age three, with gradual further development occurring in the 3;0-6; 2 age range. As Zulu speakers are expected to produce one to nine syllable words (Cope, 1983; Poulos & Bosch, 1997), it is probable that the development of seven to nine syllable words occurs after the age of 6;2.

While the Zulu speaking subjects in the present study still required syllable development by the age of 6;2, studies on English speaking children, indicate that by age five, they are able to produce all their required word shapes (Hoffman, 1986; Shriberg, 1993). That Zulu speaking children appear to use longer strings of syllables than English speaking children, at an earlier age, may be explained by the phenomenon that Zulu appears to obey more of the natural rules for preferred syllable structures, than English does. For example, all Zulu syllable structures are open, unlike English, which has both open and closed syllables. Furthermore, natural rules prefer, that vowels not be placed next to each other, which Zulu unlike English, never does. Lastly, natural rules of preferred syllable structures, avoid consonant clusters as does Zulu, but not English (Stockwell & Macaulay, 1972). It is thus evident, that Zulu words can have a long, and yet simple syllable structure, which facilitates ease of production (Cope, 1983; Poulos & Bosch, 1997). According to Stoel-Gammon & Dunn (1985), two of the most frequently produced phonological processes in English are cluster reduction and final consonant deletion. Neither of these processes can occur in Zulu, as there are no word final consonants or consonant clusters. This may explain why Zulu speaking children produce longer structures earlier. The finding of the present study support the studies on English children, which indicate that the length of syllable structure produced, is developmental in nature, meaning that children are able to produce longer and more complex structures as they grow older (Hoffman, Schuckers &

Daniloff, 1989). The first developing syllable structures in English are CV followed by VC, CVCV reduplicated, CVC, CCV and multi-syllables (Shriberg, 1993). The current study follows a similar pattern of development, in that shorter syllable structures develop first, followed by longer ones. A literature search has produced no studies on the age of development of Zulu syllable structures, that would allow comparison to be made.

The findings, regarding the frequency of syllable production, highlights that the top four most frequently produced syllable structures, occur significantly more frequently than the rest of the syllable structures, in all three age groups. These syllable structures (VCVCVC, VCVCVCVC, CVCV, CVCVCV), are produced most frequently by the subjects between the ages of 3;0-6;2. Generally, as was expected, the longer structures (five and more syllables), occur less frequently than shorter structures. The only exception being, the phonotactically simple VCV, CV which tend to occur infrequently in all three age groups. As indicated previously, not many words in the Zulu language comprise of these two structures, and the subjects would thus not have had much opportunity to produce them. The nature of a conversational speech sample, is that the structures that emerge, are spontaneous and not contrived. As was also expected, the frequency of occurrence of the longer syllable structures increased with age.

As indicated in the introduction, the structures that occurred frequently in a language, were generally acquired earliest (Stockwell & Macaulay, 1972). On comparison of the current frequency of syllable structure findings to the findings of Jacobson (1972), only one similarity emerged. Jacobson (1972), indicated that CV develops first, followed by CVCV (reduplicated), then CVC and CVCV (differentiated). With the present study, CV is low in frequency, and CVC does not occur in Zulu. The similarity is that CVCV is high in frequency and occurs early in the Zulu inventory.

In English studies, the most frequently produced syllable structure is CV, followed by VC, CVC and CVCV consecutively (Weiss et al., 1987). The only commonality between the English findings, and the findings in the present study is that CVCV is a high frequency structure in both. In the current study, the frequency of VC in all three age groups was low, and CVC does not occur in Zulu. There are no other studies on the frequency of syllable structures used by Zulu speaking children, so no comparisons could be made.

The finding, with regard to the most frequently produced syllable structure, has important clinical implications, in treating children with articulation disorders, developmental apraxia of speech as well as adults with motor speech disorders. Knowing which syllable structures are produced by normal Zulu speaking children, offers indications for a treatment plan, which

proceeds from less complex to more complex. Generally, in treating English subjects, targets would progress from isolated sounds to CV or VC words to CVC and so on. Using this format would be unsuitable for the Zulu speaker, according to the findings of this study. The PCP, which is utilised in the study, does not differentiate between those CVCV syllable structures that have varied consonants, and vowels, for example, geza, and those that are a reduplication of the same vowel, for example, puthu, or consonant, for example, lala. Zulu has some words that are a reduplication of both the consonant and the vowel, for example, lala, tata, baba, and mama, gogo. The literature indicates, that reduplication occurs earlier in the development, and is routinely used by children under the age of 2;0 (Weiss et al., 1987). The fact that no differentiation was made, in the present study, between CVCV (reduplicated), and CVCV (differentiated), may partly explain the high frequency of occurrence of CVCV. Nevertheless, according to the present study, CVCV occurs frequently in Zulu speaking children between the ages of 3;0 to 6;2.

5. CONCLUSIONS AND RECOMMENDATIONS

It is undeniable, that in South Africa, with its multilingual and diverse population, that in order to provide an equitable and appropriate Speech-Language Therapy service, much emphasis needs to be placed on determining language specific normative data, and statistical information (Groenewaldt & Musto, 1999). At present, there are limited examples, or guidelines, to follow when undertaking research, that is specific to the South African population.

The important contribution of the present study was, that it revealed children's use of sounds and syllable structures in natural, conversational speech, rather than in elicited and possibly, imitated single words. The results of the present study, indicated that Zulu speaking children have developed a significant inventory of speech sounds by the age of three, and that further development occurs in the 3;0 to 6;2 age range. It is likely that further sound development, refinement and stabilisation, occurs after the age of 6;2. The earlier developing sound classes, were found to be the nasals, plosives, approximants and fricatives, while the later developing sound classes were found to be the affricates, clicks and prenasalised consonant sounds. The frequency data indicated that the motorically simple, or more natural sounds, for example /❍ ♌ ♦ ♎/ (Vihman, 1993), tended to be produced more frequently, than the motorically complex sounds. Furthermore, the frequency of production of the more complex sounds, was greater in the older age groups, which showed developmental progression. With regard to syllable production, the results indicated that the length of the syllable strings used,

increased with age, and that shorter syllable strings were generally used more frequently, than longer syllable strings. The frequency of production of the longer syllable strings was higher, in the older subjects, than in the younger subjects.

The findings can be used to select the appropriate target consonant sounds, and vowel sounds, for use in a CVCV structure, as prescribed by the SML program. The findings can thus be used to develop a SML program for Zulu speaking children, which can be used as a general facilitation program, or as a tool for adult patients with neuromotor disorders. The findings can also be used in the adaptation or formulation of an articulation test for Zulu speakers and articulation therapy programs.

The present study was useful in providing the groundwork, or offering guidelines, when embarking on studies of this nature, as well as hopefully focusing attention on the dire need for research into the norms of development in Zulu. It must however be mentioned, that the present study would have required a larger subject population, a broadening of the upper and lower age limits, as well as an increase in the required speech sample size, in order for the findings to be generalised to the larger population. The fact that intensive and extensive normative research within a specific cultural group is impeded by financial limitations, is undeniable. Intensive normative research is however, vital in providing the foundation for all further research in speech and language, as well as in developing language and culturally appropriate assessment and therapy tools. It is suggested that attention be paid to the stringent methodology employed in the present study, which has the potential to offer insights into conducting a variety of similar normative studies. Of particular interest, in the methodology, were the pre-selection criteria, the carefully described population, the pre-evaluations, the value of utilising a continuous speech sample, as well as the advantages of using relevant and available technology, like the PCP. Furthermore, the present study highlighted that potential researchers need not be daunted, or overwhelmed by the idea of conducting research on a population whose first language does not match that of the researcher. The involvement of a well-selected research assistant, with the appropriate cultural and linguistic background, serves to minimise the potential hazards of cross-linguistic studies.

The present study was small, and limited by practical and financial factors. The information obtained was however, important and necessary, and represented a basic step in the process of developing a comprehensive Zulu speech database. Clearly, additional studies are needed to bring our knowledge of Zulu articulation in children, in line with the information we have on English speaking children, and to further enhance our knowledge base.

RECOMMENDATIONS FOR FURTHER RESEARCH

It is recommended that a larger sample of children be used in a study of this nature, to allow for greater representivity and accuracy of results. If the speech sample size is increased, it is recommended that the data collection be done in at least two sittings to minimise the effects of fatigue. It is recommended that a larger population be selected, to ensure greater variability and representivity within each age group. In the present study, once the pre-eliminations had been done, the population, especially in Group 1 was small. Furthermore, the population tended toward the upper limit of the age group. It is further recommended, that future researchers consider widening the upper and lower age limits, because the current study indicates that much sound development occurs before the age of three, and sound development continues beyond the age of six. It would also be beneficial to increase the size of the speech sample to 200 or more words. In consideration of the large Zulu speech sound inventory, a larger sample is necessary to ensure that the range and distribution of speech sounds is represented.

In order to improve clarity of recordings, it is recommended that a room separate from the school, be identified especially if there are wooden floors. This was not possible in the present study, and while all efforts were made to reduce the noise, a few segments of the recordings had to be eliminated, as they were inaudible. Furthermore, it is recommended that an audio recorder, which offers a VU meter, be employed, to ensure the clarity of the recording.

Complementary research, using the same methodology and consonant chart, but based on elicited words, to verify the acquisition data is recommended. As mentioned previously, in the present study, firm conclusions regarding the age of acquisition, could not be made, as the subjects may have been able to produce a specific sound, but may not have had the opportunity to do so. Future research could also utilise the same methodology, on different sample groups, or different language groups, to compare the findings. Replication of the study to check the stability of the results, could also be embarked upon. Furthermore, reporting the data in terms of word position, which exerts an important influence on production, would also be useful, and is an important aspect to include in future studies.

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Zulu consonant chart

		Bilabial			Labio-dental		Dental			Labio Velar		Alveolar			Post Alveolar		Palatal			Velar				Alveo Lateral			Palato Lateral		Glottal	
		V	A	VL	V	VL	V	A	VL	V	VL	V	A	VL	V	VL	V	A	VL	PV	V	A	VL	V	A	VL	V	VL	V	VL
Plosive	M																													
	N																													
	L																													
Nasal	M																													
	N				*																									
	L																													
Fricative	M																													
	N																													
	L																													
Approximant	M																													
	N																													
	L																													
Affricate	M																													
	N																													
	L																													
Implosive	M																													
	N																													
	L																													
Clicks	M																													
	N																													
	L																													
Corresponding orthography (read from top to bottom)		b	ph	p	m	f	gc	ch	c	w		d	th	t	j	sh	ny	qh	q	k	g	kh	k	(n)dl	xh	(n)hl		kl	hh	h
		m			v	(m)f	ngc		nc			n		s		y	gq		nq		ng			gx		x				
		b			(m)v							z		hl		tsh	ngq							ngx		nx				
												dl		ts																
												l																		
												(n)z																		

Notes on the table:

1. The asterix indicates where there is prenasalisation, meaning sounds that occur only as prenasalised sounds.

2 V = Voiced
A = Aspirated
VL = Voiceless
M = Medial
N = Nasal
L = Lateral

3. The following sounds also have a prenasalised value and were treated as separate sounds

Speech sound	Example
	injabulo
ts -	insipho
t -	intsha
k -	inkinga
t - nt	intaba
d - nd	indoda
p - mp	impunzi
b - mb	imbazo

APPENDIX A

APPENDIX B

TEACHER CHECKLIST

CHILD'S NAME: _____

Do you suspect this child of any of presenting with any of the following?

PROBLEM	YES	NO
PROBLEMS WITH VISION		
PROBLEMS WITH HEARING		
MENTAL RETARDATION		
PHYSICAL DISABILITY		
DEVELOPMENTAL DELAY		
DELAYED LANGUAGE DEVELOPMENT		
DELAYED SPEECH DEVELOPMENT		
EMOTIONAL IMMATURITY		
UNSTABLE FAMILY BACKGROUND		
LEARNING PROBLEMS		
POOR SCHOOL ATTENDANCE		

APPENDIX C

Thank you for agreeing to participate in this study. Your child's participation will assist us in formulating tests and therapy programs for Zulu speakers.

The questionnaire will not take up more than 5 minutes of your time. On completion, please seal in the envelope provided, and send it within 7 days to the school principal, Mrs. Pillay.

Please fill in the following information with regard to your child, as accurately as possible.

1. Child's Name : _____

2. Date of birth : _____

3. Age : _____

4. Home language : _____

5. At what age did your child learn to sit on his/ her own? _____

6. At what age did your child learn to stand? _____

7. At what age did your child start walking on his/her own? _____

8. At what age did your child say his/ her first words? _____

Please tick the appropriate response

9. Does your child have problems hearing?	YES	NO
10. Does your child have problems seeing?	YES	NO
11. Does your child's speech sound like other children his age?	YES	NO
12. Does your make sentences like other children his age?	YES	NO
13. Has your child had any significant health problems? If YES, what were they? _____	YES	NO
14. Has your child had to be hospitalised for more than a month?	YES	NO

Thank you for taking the time to fill in this questionnaire.

Please rest assured that all the information on this questionnaire would be kept strictly confidential.

APPENDIX D

Siyabonga ukuthi uvume ukudlala indima kulolucwaningo. Ukungenela kwakho kuzisisiza ekwakheni izinhlelo zezivivinyo nezokwelapha zabantu abakhuluma isiZulu.

Lemibuzo ngengane yakho ngeke ithathe ngaphezukwemizuzu emihlanu yesikhathi sakho. Uma usuqedile faka emvilophini uyivale bese uyithumela kuthisha nhloko Nkosikazi Pillay zingakapheli izinsuku ezinhlanu.

Gcwalisa lokho okulandelayo mayelana nengane yakho ngokukhulu ukucophelela.

1. Igama Lengane : _____

2. Usuku lokuzalwa : _____

3. Iminyaka : _____

4. Ulimi olukhulunywa ekhaya : _____

5. Wayengakanani efunda ukuzihlalele? : _____

6. Wayengakanani efunda ukuzimela? : _____

7. Wayengakanani efunda ukuzihambela? : _____

8. Wayengakanani eqala ukukhuluma? : _____

Yenza uphawa kwimpendulo efanele.

9. Ingane yakho inayo inkinga yokuzwa?	YEBO	CHA
10. Ingane yakho inayo inkinga yokubona?	YEBO	CHA
11. Ingane yakho iyakwazi ukukhuluma njengontanga bayo?	YEBO	CHA
12. Ingane yakho iyakwazi ukwakha imisho njengontanga bayo?	YEBO	CHA
13. Ingane yakho yake yaba nezinkinga ngokwempilo? Uma impendulo kungu yebo, kwakuyiziphi? _____ _____ _____ _____	YEBO	CHA
14. Yake yalala ingane yakho esibhedlela isikhathi esingaphezu kwenyanga?	YEBO	CHA

Siyabonga ngesikhathi osithathile ukugcwalisa leliphepha lemibuzo.

Siyakuqinisekisa ukuthi konke okubhalwe lapha kuzogcinwa kuyi mfihlo.

OTOSCOPIC EXAMINATION		
ANY EVIDENCE OF:	YES	NO
Foreign bodies *		
Large amounts of wax *		
Impacted wax *		
Scar tissue		
Light reflex		
Ear infection *		
Collapsed canal walls *		

* If yes, make appropriate referral.

PURE TONE TEST						
FREQUENCY (Hz)	35d B	INTENSITY 25dB			20 dB	
	L	R	L	R	L	R
1000 Hz						
2000 Hz						
4000 Hz 35 dB & 25 dB only						

Note : Indicate – yes (Y) or no (N)

HEARING SCREENING

1. CASE INFORMATION

NAME:_____
D O B: _____
SCHOOL: _____

2. RESULTS

TEST	PASS	FAIL
Otoscopic Exam		
Pure tone		

3. REFERRAL REQUIRED?

3.1 INDICATED YES / NO

3.2 IF YES:

- G. P.
- AUDIOLOGIST
- E. N. T.
- OTHER

4. COMMENTS: _____
_____

SCREENED BY: _____
DATE : _____

APPENDIX E

OROFACIAL SCREENING CHECKLIST

Name: _____ **Date:** _____
Examiner: _____

Structure	Assess	Tick if appropriate Comment if deviation noted
Lips	Symmetry at rest Closure Rounding Spreading	
Dentition	Occlussal relationship	
Tongue	Size Lingual frenum Tip up Tip Down Tip left Tip right Tip drawn back along hard palate	
Hard palate	Vault height Vault width	
Soft Palate	Symmetry at rest Length Velar elevation	
Uvula	Shape Position	
Diadochokinesis	Normal movement patterns: Tuh Puh Kuh	
General observation / other findings		

Pass / Fail: _____

Recommendation for followup: _____

APPENDIX F

APPENDIX G

Grey's Hospital
Private Bag X9001
Pietermaritzburg
3200
02/11/2002

The Principal
Elangeni Preschool
Pietermaritzburg
3200

Dear Mrs. Pillay,

Re: Request for permission to conduct a research project at Elangeni Preschool.

I am a Masters student at the Department of Communication pathology, (University of Pretoria). In addition, I work on a fulltime basis at Grey's Hospital. In the course of my work, often assess and treat Zulu speaking children with speech problems. I often have great difficulty in assessment as very little research has been conducted on Zulu speakers. It is this concern that compelled me to embark on the present study.

The aim of the study is to describe the sequence in which normal, Zulu speaking children develop their sound system, as well as to describe the types of syllable structures they use at different ages.
I would like to conduct a research project at your school. Three age groups are necessary with six children per age group. The age groups are:

3;0 to 4; 0
4; 1 to 5; 1
5; 2 to 6;2

A total of 18 normally developing Zulu speaking children are thus needed. A 100-word speech sample will be collected from each child, and this will take approximately 25 minutes per child. I guarantee that I will make every effort not to disrupt the proceeding of the school day while collecting the data, and I assure you that all individual information will be confidential.

I am very hopeful that you will give me this opportunity. I will be glad to share the findings with you and the parents. I will also gladly share information regarding any aspect of Speech, Language or Hearing disorders, that are of interest to you, or would be beneficial to your school. I will contact you telephonically to arrange a meeting to discuss the details if you are willing to participate in the study.

Yours Faithfully

_____
Y. Naidoo
Speech Therapist / Audiologist

APPENDIX H

Grey's Hospital
Private Bag X9001
Pietermaritzburg
3200
Tel. 033 – 8973198
0828362209

18/11/2002

Dear parent,

I am a Speech Therapist-Audiologist studying for a Masters degree in Communication Pathology, at the University of Pretoria. Mrs. Pillay, the school principal, has agreed to allow me to conduct a research project at Elangeni Preschool. I will be conducting a study on the pattern of speech sound development in normal children between the ages of three and six, in December, 2002.

I humbly ask permission for your child to participate in the study. Your child's hearing will be screened, and a speech sample will be obtained, through play activities. I will not take more than 30 minutes of your child's time. Please note that the study will not put your child at any risk, and all individual information will be kept confidential.

If you consent, please sign the attached consent form and send to Mrs. Pillay by, 26 November, 2002. If you consent, I will forward a short questionnaire to you, which will not take more than 5 minutes to fill in. If you would like further details, please feel free to contact me at the number provided. I would also be happy to share the findings of the study at your request.

Your permission would be much appreciated and will allow is us to gain valuable information regarding normal speech development in Zulu speaking children.

Yours faithfully

_____	_____
Y. Naidoo	Prof. van der Merwe
Speech Therapist-Audiologist	Supervisor

CONSENT FORM

CHILD'S NAME : _____
PARENT'S NAME : _____

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

_____
PARENT SIGNATURE

APPENDIX I

Grey's Hospital
Private Bag X9001
Pietermaritzburg
3200
Tel: 033 – 8973198
18/11/2002

Mzali,

Mina ngisebenza ngabantwana abanenkinga yokukhuluma kanye nokuzwa (Speech Therapist). Njengamanje ngiyafunda, ngiqhuba iziqu eziphathelene nokufundisa ukukhuluma ngendlela efanele kubantwana abasebancane.

Bengike ngakhuluma nothishanhloko, Unkosikazi Pillay, savumelana ukuthi ngizocwaninga Elangeni pre-school.Ngizobe ngicwaninga indlela abaphimisa noma ababiza ngayo izinhlamvu zenkulumo, kubantwana abaneminyaka emithathu kuya kweyisithupha ngenyanga kaDecember kulonyaka (2002).

Ngokuzithoba okukhulu ngicela nivumele abantwana benu ukuba babe yingxenye yalokufunda. Indlela umtwana wakho akhuluma ngayo kanye nendlela ezwa ngayo iyohlolwa ngobafundisa imidlalo. Lesisifundo isokudlala ngeke seqe emizuzwini engamashumi amathathu (30 minutes). Ngicela niqiniseke ukuthi akekho umtwana oyohlambalazeka kulolucwaningo, konke okutholakalayo kuyoba imfihlo yomuntu ngomuntu.

Uma uvumalana nalesicelo, ngicela ukuba usayine lelifomu bese ulibuyisela ku – thishomkhulu, u Mrs. Pillay, engakashayi uMhlaka 26 November, 2002. Uma uzwelana nami, ngizocela ukuba uphendule imibuzwana emifishane engizoyithumela. Lemibuzo ngeke ithathe namaminithi amahlanu (5 minutes).

Ngigajabula kakhulu uma isicelo sami nisamukela, kanti futhi kuzosiza ukuqhubekisa phambili ulwazi lwabantwana abakhuluma isizulu ulimi lwabo.

Yimina Ozithobayo

_____
uNkosazana Yugeshiree Naidoo
Speech Therapist-Audiologist

Ifomu yokuvuma

Igama lomntwana **:** _____
Igama lomzali : _____

Ungathanda yini ukwazi ngokutholakele kwlolucwaningo? Yebo / Cha
Ngiyavuma ukuba umntwana wami abambe iqhaza kulolucwaningo.

_____
Sayina lapha

APPENDIX J

ETHICS APPROVAL

NO APPENDIX J AVAILABLE

RECORD SHEET **DATE** _____

NAME OF SUBJECT:	NAME OF SUBJECT

APPENDIX K

APPENDIX L

Unibet list

NO APPENDIX L AVAILABLE