THE PERFORMANCE OF HEARING IMPAIRED CHILDREN ON THE REVISED EXTENDED GRIFFITHS SCALES

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I dedicate this treatise
to the three
most important people in my life,
my parents and fiancé

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ABSTRACT

In this unique time of nation building in South Africa, education is seen as the key foundation stone to prosperity and development. However, despite a decade of restructuring, many differing groups of children still do not receive the quality of education they deserve. Amongst those are children with special needs, including those who have a hearing impairment. These children are the focus of the present study.

It is a widely accepted principle that early assessment and intervention is necessary to maximise a child's potential. It is for this reason that the global aim of this study was to explore and describe the developmental profile of hearing impaired children on the Revised Extended Griffiths Scales. Further aims were to compare the performance of the clinical sample to a normal South African sample. A quantitative, exploratory-descriptive research design was employed. The sample of hearing impaired children (N = 58), between the ages of 36 and 95 months, attended the Carel du Toit Pre-School in the Western Cape, South Africa and were obtained by means of a non-probability, purposive sampling procedure. The normal sample (N = 58) was drawn from an existing database created for the revision of the Scales. Information was collated using clinical files, biographical data as well as the results of an assessment on the Revised Extended Griffiths Scales.

The major findings of the study are summarised below.

The general performance of the hearing impaired sample on the Revised Extended Griffiths Scales was average. The performance of the children on the six subscales ranged from below average to average, with major fall-outs occurring on the Hearing and Speech and Practical Reasoning Subscales.

The normal sample performed significantly better than the hearing impaired sample on all of the subscales of the measure. However, significant differences were found on four of the six subscales, namely, the Locomotor, Personal-Social, Hearing and Speech and Practical Reasoning Subscales.

Generally, the results of the current study suggest that a specific developmental profile is obtained for hearing impaired children. In addition, this study has highlighted the success with which the Revised Extended Griffiths Scales can be utilised on a hearing impaired population.

Key words: Hearing Impairment, Child Development, Developmental Assessment, Griffiths Scales of Mental Development, Revised Extended Griffiths Scales, Developmental Profile

CHAPTER ONE: INTRODUCTION

Hearing loss in children is a silent and hidden disability because children are unable to communicate that they have a hearing problem. Of all the sensory disabilities present in children, deafness is generally regarded as the most serious because of its far-reaching influence on the mental, emotional and social development of the affected person (Marschark, 1993). Helen Keller (in Stevens & Warshofsky, 1966) once said:

> "I am just as deaf as I am blind. The problems of deafness are deeper and more complex, if not more important, than those of blindness. Deafness is a much worse misfortune. For it means the loss of the most vital stimulus – the sound of the voice that brings language, sets thoughts astir, and keeps us in the intellectual company of man" (p.145).

These poignant words describe how most children with a hearing loss experience a more limited world than hearing children. Beyond the direct effects of deafness, namely, those relating to hearing and speech, there are a variety of consequences of children's hearing loss that affect their interactions with the environment. What begins as a sensory problem, may become a perceptual problem, a speech problem, a communication problem, a cognitive problem, a social problem, an emotional problem, an educational problem and ultimately a vocational problem (Diefendorf, 1996; Northern & Downs, 2002). These secondary impairments are usually further compounded by parental problems, as well as difficulties in adapting to a society that very often discriminates against people with a disability. Figure 1 highlights the possible deficits that hearing impaired children may suffer as a result of their sensory deficit.

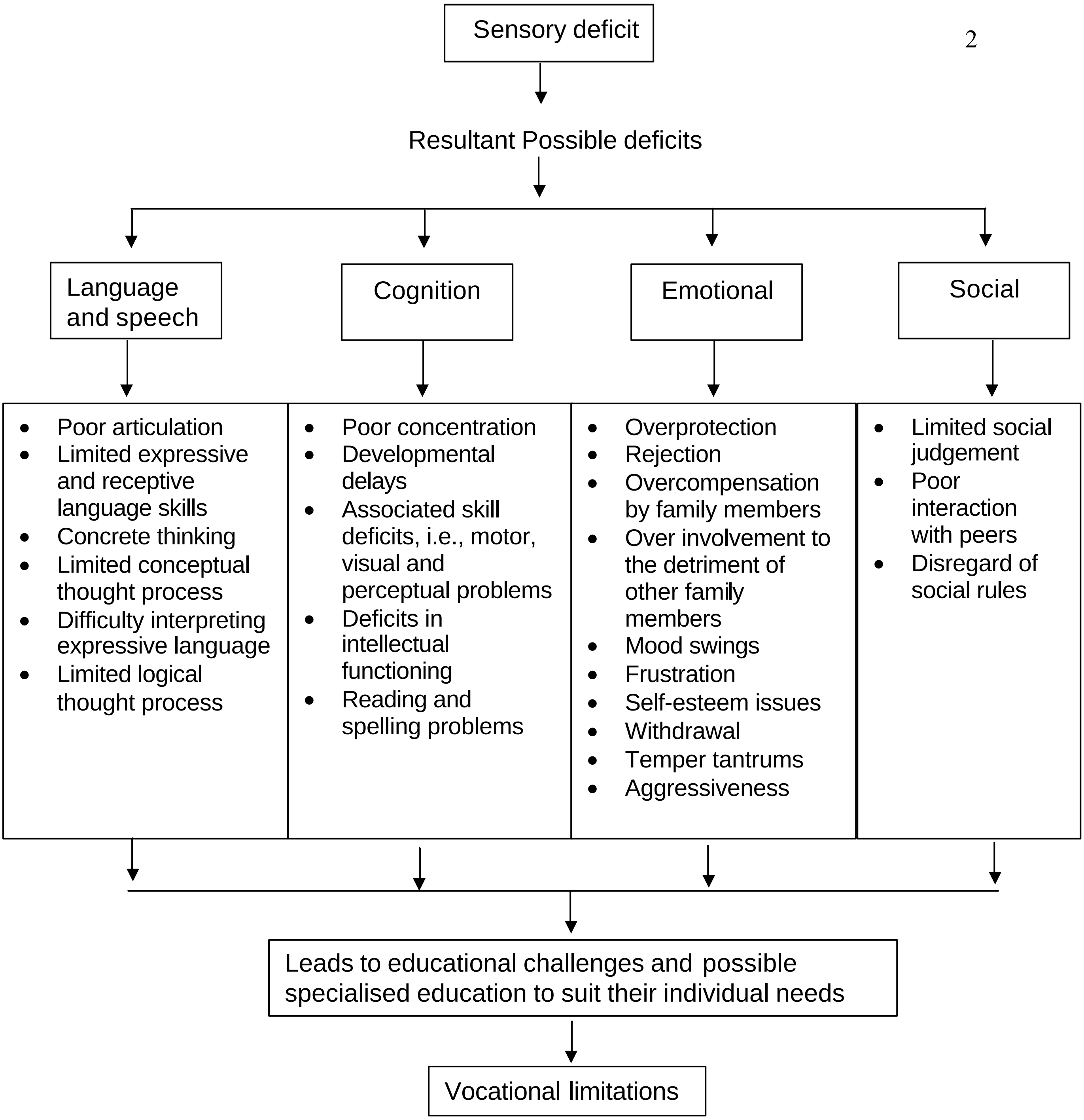


Figure 1: Possible deficits that may arise from a sensory deficit

Language provides a core around a child’s feelings and the formation of relationships. The child’s intellectual, emotional and spiritual development are primarily linked to the knowledge of language and the purposeful use of it to make meaningful interpretations of the world. In addition, language is central to the child’s ability to deal with internal motivation and external control (Schirmer, 2001). When a child lacks language, it hampers the actualisation of his/her cognitive abilities, which in turn leads to lesser developed emotional life and poorer social interactions. The ability to communicate thoughts, wants and needs to others and, in turn, the understanding of thoughts and feelings of others depend on crucial language skills. To understand social relationships, abstract concepts are important, as relationship content is often reflected in words such as honesty and loyalty. Such words give meaning to and strengthen interpersonal relationships. Hearing impaired children are, however, inclined to attach concrete meaning to words and sentences and a lack of understanding of abstract concepts may limit their social interactions with significant others. As a result of the inability to communicate, hearing impaired children are largely isolated from their hearing contemporaries and live in a world of their own.

At the outset it should be acknowledged that any attempt to provide complete and accurate descriptions of hearing impaired children is unlikely to succeed as the variations are wide. In the case of the hearing impaired population, the variability among children is influenced by amongst others: (a) whether the hearing impairment is hereditary or adventitious; (b) physiological factors related to the impairment (e.g., degree and quality of hearing loss); (c) whether the child is born into a hearing impaired or hearing family; (d) the extent of linguistic and non-linguistic interpersonal experience; and (e) the quality and type of education the child receives (Diefendorf, 1996; Marschark, 1993).

No one has adequately defined the parameters of a hearing disability and it is thus extremely difficult to estimate the prevalence of hearing impairments. According to Flexer (1999) the population of hearing impaired children is shifting. Today the number of children with severe to profound hearing impairment is less than half what it was 10-30 years ago due to the reduction in rubella and Rh incompatibility. There are, however, many more children with mild to moderate hearing impairment who have been identified and fitted with amplification.

With regard to South Africa, the Department of National Health and Population Development (1987) estimated that there were 80 000 significantly hearing impaired people in the country in 1987. The report stated that 35 of every 1 000 people in South Africa are significantly hearing impaired and 1.18 of every 1 000 people are totally deaf (Department of National Health and Population Development, 1987). By contrast, the Human Sciences Research Council (1989) reported that in 1989 there were 277 187 deaf- and 831 561 hard-of-hearing people in South Africa. The figures indicated that 35% of the total were children under the age of 14 years. The General Statistic Service of 1994 estimated that there were 4 028 373 deaf and hearing impaired people out of a total population of 40 284 634 (Deaf Federation of South Africa, 2003). From this, 402 847 people are profoundly deaf, while 1 208 539 are severely hearing impaired and 2 417 078 are moderately hearing impaired.

Although a staggering 10% of the total population in South Africa is hearing impaired, only limited services are available to this clinical population (Deaf Federation of South Africa, 2003). While some of the nine provinces in South Africa are highly urbanised with many resources for hard-of-hearing people, others have no services for this population whatsoever (Deaf Federation of South Africa, 2003). Gauteng, Western Cape and KwaZulu Natal, for example, have facilities such as schools, associations and clubs for the hearing impaired. Provinces such as the Eastern Cape, Free State and Northern Transvaal have limited services, while the Northern Cape, North-West and Eastern Transvaal have no services at all. Figure 2 below gives an indication of the hard-of-hearing population in South Africa and by implication highlights the lack of services.

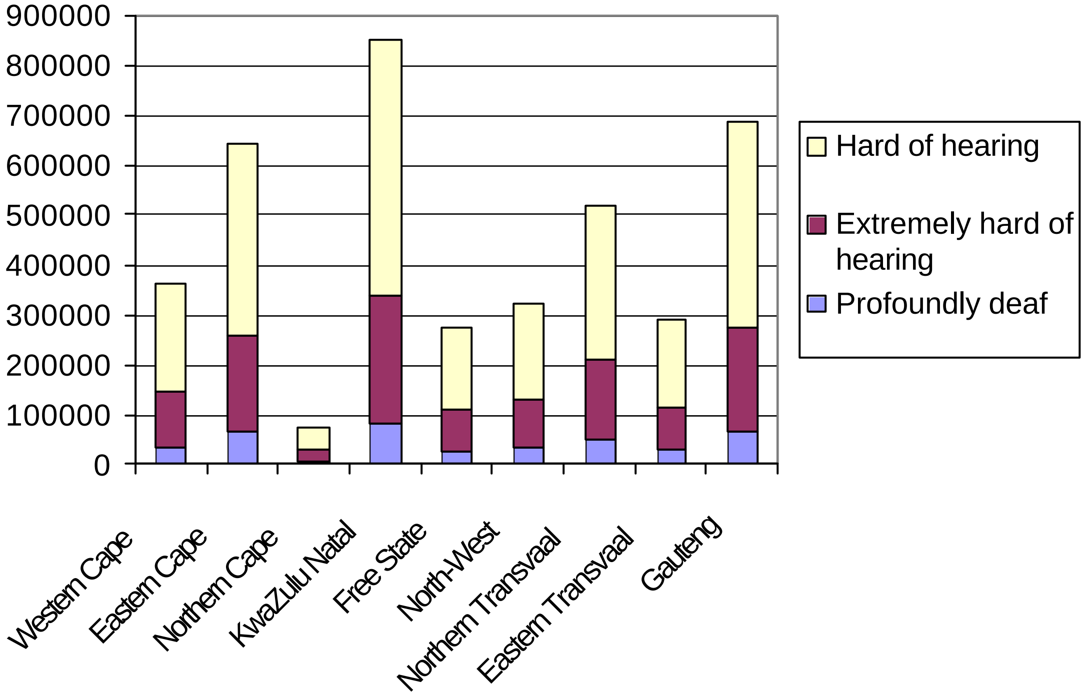


Figure 2: Estimated statistics of deaf and hard-of-hearing people in South Africa

(Deaf Federation of South Africa, 2003)

In South Africa, education for learners with special needs has historically been provided for within a separate system of specialized education. Over the past few years, following international trends, there have been a few informal initiatives towards integration of learners with special needs into regular schools. The view that a hearing impaired child should be placed in a regular school, with required supportive services, is rapidly becoming a more popular view. However, in an aurally handicapped child, it needs to be borne in mind that the degree of hearing loss is not the only criterion for special school placement as great differences may exist amongst such a group. Factors that need to be considered are, for example, the level of intellectual abilities, degree of hearing loss, age the hearing loss was diagnosed, home circumstances and personality traits. Furthermore, educational achievement of the hearing impaired child depends on factors such as family involvement and interaction, as well as guidance and knowledge of the parents. Without specialised supportive services, these factors may be neglected and hearing impaired children may be robbed of their right and need to receive intervention programmes which are multidisciplinary, technologically sound and most importantly, take cognisance of the specific context, namely, the community and country in which the child and family function.

In South Africa, hearing impaired children are exposed to two main methods of learning, namely, oral or total communication. The Carel du Toit Pre-School, from where the sample for this study was drawn, uses the auditory-oral approach to teach language. The children are educated in regular learning environments, based on experiential and outcomes based education. The school program is practical and each week a theme is followed, with the children going on experiential outings. Follow-up work on the theme is consolidated in the classroom using play, language and stories, as well as practical activities such as cutting, pasting and drawing. Through these activities the children's non-verbal skills are developed and thus all skills necessary for successful learning in mainstream schooling are enhanced. The teachers take into account the interest of the different age groups and plan the activities associated with the theme well in advance.

In contrast to the auditory-oral approach, the basic premise of total communication is to use all methods of communication, namely, sign, gesture, finger spelling, speech, hearing, lip movements and facial expression. The advantages and disadvantages of the methods of communication are today still vehemently debated. Despite these debates, the fact, that a large number of hearing impaired children are in a position to acquire speech and language naturally, by means of various amplification methods, has been proven. Conventional hearing aids enable most hearing impaired children to hear and gain access to spoken language. For those children with profound hearing loss who are unable to acquire adequate speech despite amplification, cochlear implants can present electrical stimulations of the speech signal directly to the auditory system and thus mimic features of normal audition and speech perception. In this way they also may be able to learn language using an oral method.

Research has established that accurate developmental assessment of infants and young children is crucial in the early detection and intervention of any possible developmental delays. Unobtrusive developmental variations detected by such an assessment may be the first indication of chronic disorders and disabilities. Thus early assessment of the developmentally delayed child is of vital importance for the following reasons. Firstly, the early identification of a child's areas of developmental weakness will enable professionals such as psychologists, occupational therapists, physiotherapists and remedial teachers to provide appropriate intervention in the pre-school years to develop the areas of developmental delay. Secondly, the child can be encouraged and assisted to capitalise on the identified strengths to ensure optimum development. The early identification of a hearing impaired child specifically is vital as an infant's nervous system needs sound stimuli, especially human speech, in the early and critical learning periods in order to develop verbal communication skills. Understanding the difficulties experienced by hearing impaired children and its resultant communication dysfunction has critical implications for the development of effective rehabilitative strategies, the implementation of effective intervention models, the education of those entering the hearing health care professions, and the life quality of the children who are hearing impaired (Erdman & Demorest, 1998).

The early identification and intervention of hearing impaired children leads to better speech and language development and the possibility that more hearing impaired children are able to be educated in mainstream schooling. Being a developing country, South Africa lacks trained personnel and test material to facilitate the early detection of hearing impairment in children. Therefore most children in our country, especially those living in rural areas, do not have the privilege of being identified at an early age and receiving appropriate intervention. As a result, their development may be hampered, they may never learn to communicate effectively, they may never succeed in their schooling and may become isolated in a world of hearing. It is therefore crucial that an assessment measure is identified that can be administered by various professionals and that can identify children who are at risk of a developmental delay, be it as a result of a hearing loss, neurological disorder or medical illness.

In evaluation of the most prominent developmental assessment measures utilised in South Africa, it has become evident that the Griffiths Scales of Mental Development are an appropriate test to administer to hearing impaired children (Griffiths, 1984; Luiz, 1988a). The Griffiths Scales (Griffiths, 1954) were developed in Great Britain by Ruth Griffiths who postulated that the Scales allow for early identification and intervention of impaired children.

> "The necessity to come to a position where we can compare one child with another, or a backward child with his own age-group, and do this with a high degree of accuracy, is the first step towards getting help, whenever possible, for that child" (Griffiths, 1984, p.87).

The Griffiths Scales are a comprehensive test of development and were developed by observing children in their natural environment, while they were engaged in their natural activities such as walking, talking and playing. They were first developed for use with children from birth to 2 years of age. During the 1960's they were expanded to cover ages from birth to 8 years 4 months. In 1977 they were introduced in South Africa mainly in response to the need for an adequate intellectual assessment instrument for pre-school children (Heimes, 1983).

Griffiths (1984) established a developmental profile for hearing impaired children on the original Scales, allowing practitioners to compare the performance of hearing impaired children to other children within similar age groups. Luiz (1988a) confirmed this profile with her case study on a 30-month old hearing impaired boy. According to Griffiths (1954) the function of the Scales is not to say that 'this child is hearing impaired', but to show that on the Scales, the child performs below average on two of the six subscales, namely, the Hearing and Speech and Practical Reasoning Subscales. Such a profile may indicate a hearing loss in a child and the need for further investigation. With the knowledge about the child's performance on the Scales, the psychologist, audiologist, remedial teacher and other medical staff are more alert to the need of the young child, and are able to advise and guide parents in educating and training the child who may need special care and attention. Follow-up studies can also be conducted to monitor progress and to make appropriate readjustments to the intervention programmes.

The Griffiths Scales allow the tester to assess the nature of the problem in two separate ways, by asking two questions. Firstly, "how impaired is the child?" and secondly "in what specific direction is he/she failing?" With this knowledge the child's total potential as well as his/her weaknesses can be identified. Furthermore, the Scales can play an important role in the correct placement of hearing impaired children in pre-schools and junior primary schools.

A pertinent issue raised is whether the Griffiths Scales, which were developed for a specific cultural group at a specific time in history, can be legitimately administered and applied to groups of different cultures and in different contexts. Numerous South African studies have demonstrated that although the Scales appear to be culture-fair, some items require close analysis and possible revision (Allan, 1988, 1992; Bhamjee, 1991; Heimes, 1983; Luiz, 1994a; Luiz, Oelofsen, Stewart & Mitchell, 1995; Stewart, 1997; Tukulu, 1996). Thus in an attempt to adapt and make the Griffiths Scales more contemporaneous, a large-scale revision of the Scales was initiated in 1994. Since the induction of this project, numerous projects have been completed to improve the content coverage of the assessment measure (Barnard, 2000; Kotras, 1998; Luiz, Collier, Stewart, Barnard & Kotras, 2000). Part of the revision process is to assess the usefulness of the Revised Extended Griffiths Scales on clinical populations. With the far-reaching implications that a hearing loss has on a child's development, it is important to determine whether a similar profile for hearing impaired children is established on the Revised Extended Griffiths Scales as was established on the original Scales.

It is against the above mentioned background that the current study was undertaken. In communication with the Carel du Toit Pre-School, a need for a developmental assessment of the children was identified. Thus the aim of the current study was to establish a profile of hearing impaired children attending the pre-school. The Revised Extended Griffiths Scales were utilised for this purpose.

In order to contextualise the study, Chapter 2 introduces the reader to the auditory system and the process of hearing. Emphasis is placed on hearing impairment, with a focus on the prevalence, types and causes of hearing losses. Possible effects of a hearing loss are highlighted and attention is focused on available interventions.

Chapter 3 provides an overview of child development and developmental assessment, including some of the most widely used assessment measures used to assess young children. An emphasis is placed on the need to identify the strengths and weaknesses in young children with a hearing loss, so as to identify possible intervention strategies which allow maximum development.

Chapter 4 describes the Griffiths Scales of Mental Development in detail. An overview of the construction and content of the Scales is provided, followed by a discussion on the standardisation of the measure. The administration and scoring of the Scales is highlighted in the chapter with guidelines on how to interpret the performance of children on the measure. In addition a comprehensive review of the research conducted on the Scales is provided. This includes a summary of the reliability, construct and predictive validity of the Scales as well as the pilot normative and case studies conducted. The chapter ends by examining the revision and restandardisation process of the Scales on both normal and clinical populations.

Chapter 5 depicts how the aims of the study were met. An outline of the methodology employed in conducting the study, as well as the analysis of data is provided. The results and discussion thereof are presented in Chapter 6. The implications of the study are outlined, with specific reference to the impact of this study on the assessment of hearing impaired children, using the Revised Extended Griffiths Scales. Finally, Chapter 7 provides a discussion of the conclusions and limitations inherent in the study, and suggestions for possible future research are addressed.

CHAPTER TWO: THE AUDITORY SYSTEM AND HEARING IMPAIRMENT

2.1. Introduction

This chapter will provide an overview on the structure and evolution of the ear, followed by a discussion on the development of hearing and the definition of a hearing impairment. The types and causes of hearing loss, the co-morbidity of hearing impairment with other medical conditions, as well as amplification and methods of learning and communicating will also briefly be addressed.

2.2. The Structure and Evolution of the Ear

As shown in Figure 3, the ear is divided into three sections: the outer, the middle, and the inner ear (Northern & Downs, 2002; Woodson, 2001; Green, 1999; Flexer, 1994).

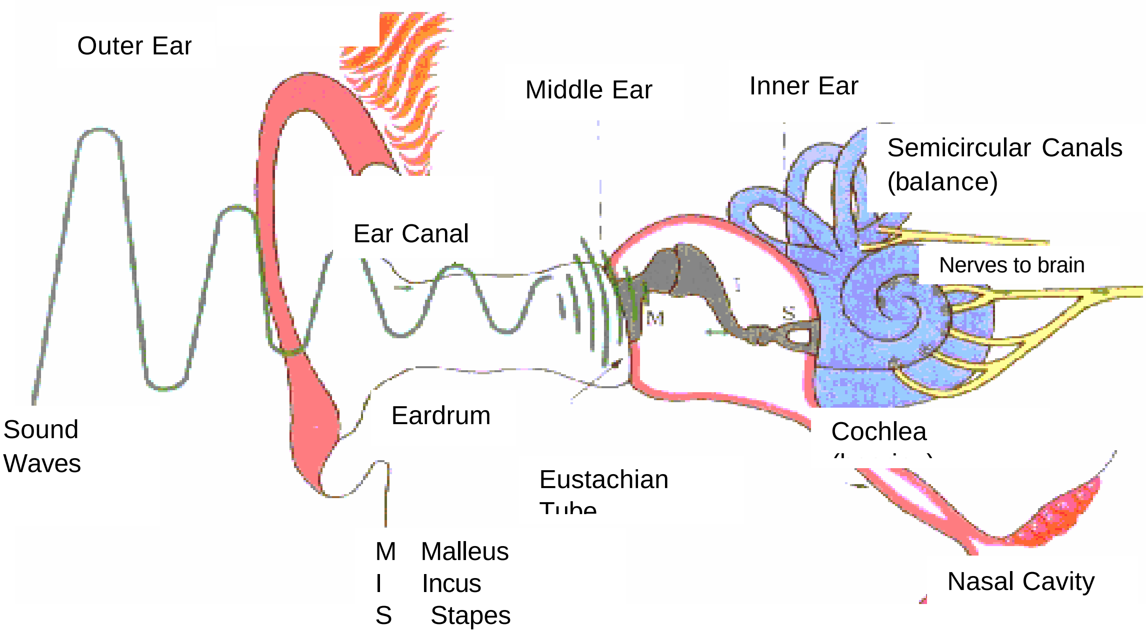


Figure 3: <u>Anatomy of the ear</u>

The *outer ear* is the first point of contact between the individual and the sound. It consists of all the parts of the ear that lie lateral to the tympanic membrane (the eardrum) and includes the pinna and the auditory (ear) canal.

The pinna is composed mainly of cartilage and its function is to capture and funnel sound waves down the auditory canal to the middle ear. The convolutions of the pinna also act to provide resonance to the incident sound. This function provides important information for sound localisation (Hawler & McCombe, 1995). In the auditory canal there are small hairs and glands that secrete wax and protect the ear from dust and insects. The posterior part of the auditory canal ends at the tympanum. When sound waves beat against the tympanum, it vibrates and transmits the sound waves to the middle ear.

The *middle ear* includes the tympanic membrane and a small air-space lying between the tympanic membrane and the bony wall of the inner ear. The middle ear contains the three smallest bones of the body, the ossicles, known as the malleus, incus and stapes. Two muscles in the middle ear, the stapedius and tensor tympani muscle are stimulated by loud sounds and have a role in protecting the cochlea from the damaging effects of noise.

When the sound is steered into the middle ear, the tympanic membrane is set into motion by the sound waves and begins to vibrate. This vibration then sets the ossicles into motion and sound is carried through the oval window into the inner ear. The Eustachian tube opens into the inner ear and is also connected to the nasal cavity to ensure an equal degree of atmospheric pressure on both sides of the eardrum. This is necessary to preserve the eardrum’s sensitivity to sound waves because if the atmospheric pressure differs, the eardrum looses some of its vibratory capacity. The middle ear thus acts as a transformer, converting the low pressure, high amplitude airborne vibrations into low amplitude, higher-pressure fluid vibrations in the cochlea (Hawler & McCombe, 1995).

Within the *inner ear* the organs of both hearing and balance are found. The inner ear is fluid filled and is made up of the cochlea, utricle, the saccule and the semicircular canals. The cochlea, often referred to as the inner ear, is considered to be the main sensory organ for hearing, the other parts providing important information for balance.

The cochlea contains specialised hair cells which are sensitive to the vibrations sent from the middle ear. The vibrations initiate a wave complex in the cochlea fluid and displace the inner ear fluid and hair cells. The hair cells change the mechanical energy and the information it contains, into neuro-electrical signals, which are passed via the acoustic nerve to the brainstem and temporal lobe of the cerebral cortex, where the impulses are interpreted as sound.

According to Hawler and McCombe (1995) and Northern and Downs (2002) the first signs of the ear in the human embryo are seen early in the third week. At this time a cellular ectodermal thickening emerges at the cranial end of the developing embryo. Over the next 2 weeks the thickening develops into the membranous labyrinth. During the fourth week the cartilage gives rise to the ossicles. Finally, between the fourth and sixth week of gestation the external ear and external auditory canal develop. The Eustachian tube and the middle ear extend laterally between the developing internal and external ear.

By the 20th week of gestation, the inner ear has matured to adult size and the middle ear structures are developed and functional by the 37th week (Northern & Downs, 2002). The external ear continues to mature until age 7 years (Green, 1999; Flexer, 1994.) Although the origination and major changes of the hearing system take place in the mother's womb, the development does not cease, nor is it totally complete at the time of birth.

2.3. Development and Process of Hearing

Hearing involves the gathering and interpretation of sounds. Each part of the ear plays a role in translating sound waves from the environment into meaningful information to the brain (Schirmer, 2001). Research has shown that there are two general processes in hearing: (a) getting sounds to the brain through the outer, middle and inner ear; and (b) learning and interpreting the meaning of those sounds once they have reached the primary auditory receptive area in the temporal lobe (Flexer, 1994).

Research has indicated that newborns are more sensitive to sounds which come within the typical frequency range of a human voice, while being less sensitive to low-pitched sounds (Keenan, 2002). At birth the child hears imperfectly for the first few weeks, as a result of the external auditory canal not being completely free of detritus (remaining tissue) and the middle ear being largely filled with a gelatinous tissue (Allen, 1992). However, after progressive resorption has taken place, the infant can soon hear normally. If the infant continues to be less sensitive to low pitched sounds and hears imperfectly, the hearing system is not well developed.

Flexer (1994) reports that when sound is heard, an individual is actually interpreting a pattern of vibrations in the form of sound waves, which are air particles that originate from a source in the environment. After being set into motion by an energy source, the air particles collide resulting in the creation of repetitive waves. Sound has both physical and psychological characteristics (Flexer, 1994). The physical dimensions of speech sounds include *frequency*, *intensity* and *duration*, while the psychological attributes of sound are *pitch* and *loudness*. Our ability to perceive sound is affected by the product of the three physical dimensions. A hearing impairment will affect the perception of one or all of these features.

Frequency refers to the number of sound vibrations that occur in a single second (Schirmer, 2001). This phenomenon determines the pitch of a tone. The faster the vibration, the higher the pitch of the sound produced (Green, 1999). The frequency of a sound is measured in Hertz (Hz) and humans can hear frequencies ranging from 20 to 20 000 Hz. However, the frequency range generally considered most important for the perception of speech falls between 500 to 2 000 Hz (Schirmer, 2001). This corresponds to the findings of Northern and Downs (2002) who report the output pitch range of human speech to be between 500 and 3 500 Hz and close to the optimal frequency sensitivity of our hearing mechanism. From the above-mentioned findings it is clear that our hearing is designed to receive the most important element of communication, namely, speech.

Intensity refers to the pressure of a sound and is measured in decibels (dB) (Flexer, 1994; Schirmer, 2001). Research results indicate that the ear can respond to intensities between 0 and 100 dB (Schirmer, 2001). Speech sounds, however, range from about 20 to 55 dB. *Duration* refers to the overall length or time span of a sound and is critical to the sense and measurement of hearing.

The psychological attributes of sound are *pitch* and *loudness* (Flexer, 1994). All the sounds we hear are made up of a combination of basic pitches which give the sound its character: high pitches tend to make sounds 'sharper' while lower pitches tend to make sounds 'fuller' (Green, 1999). Sound varies in loudness and consequently the mechanisms of the ear have to cope with a variety of rapid changes in loudness when listening to conversation.

When hearing is tested, one of the objectives is to determine to which frequencies the ear is able to respond. The test measures the intensity a sound must reach before the ear can detect it. The point at which the sound is just detected is called the 'threshold'. People with normal hearing have thresholds of around 0 dB for all frequencies (see Figure 4). The results of the test are marked on a chart using a circle for the right ear and a cross for the left ear. The results are joined by a line which divides hearing into two regions, namely the area of lost hearing (above the line) and the area of residual hearing (below the line).

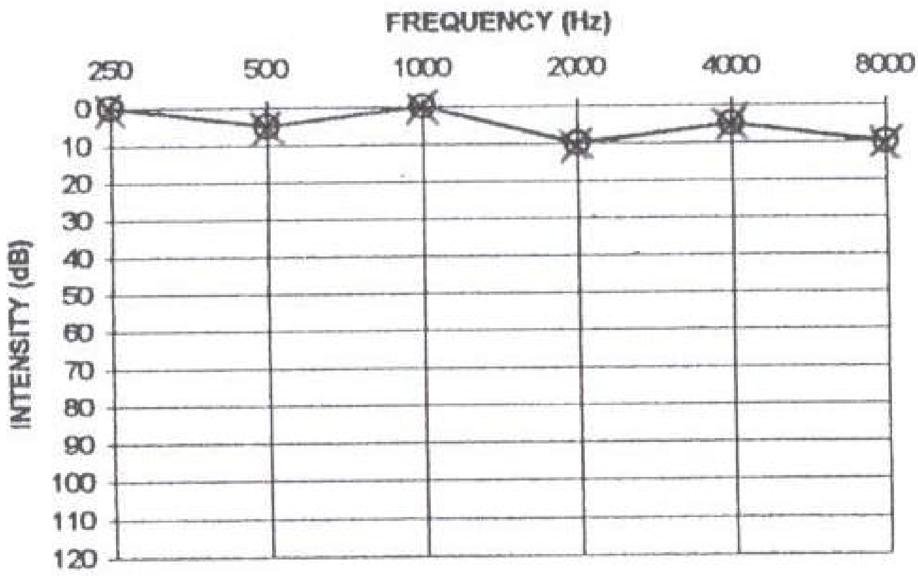


Figure 4: Normal hearing in the left and right ear

According to Northern and Downs (2002), sounds can be heard through two basic physiological pathways. The traditional pathway of sound is the *air conduction route*, which has been discussed in detail above. The second route for sound is the *bone conduction pathway*. Vibrations carried through the mandible and jaw cause the fluids to move in the inner ear as it is encased within the bones of the skull. These vibrations are transmitted directly to the inner ear, bypassing the outer and middle ear. Bone-conducted vibrations stimulate the sensory cells of the inner ear, resulting in the hearing. By comparing air-conducted and bone-conducted sounds during a hearing test, audiologists can determine the type and location of a hearing problem (Northern & Downs, 2002).

Northern and Downs (2002) report that nearly 70% of word recognition is determined by the speech frequency between 500 and 2 000 Hz. The average intensity of speech varies between 20 and 60 dB, with an average of approximately 40 dB. The human vocal range constitutes a 700 to 1 ratio of intensities between the weakest and strongest speech sounds made while speaking at a normal conversational level. Ordinary background noise varies between 35 and 68 dB. For normal hearing adults, when noise is 10-15 dB below the level of speech, the listener can fill in missing acoustic cues and no problems are experienced with communication. In contrast, with a linguistically unsophisticated infant, the speech energy must be 30 dB louder than the background masking noise because the infant cannot fill in the missing acoustics.

Figure 5 represents an audiogram which indicates the frequency and intensity of general English sounds during conversational speech, compared with common environmental sounds. The shaded area represents the 'speech banana' that contains most of the sound elements of spoken language. This diagram has been proven to be useful in counselling parents about the audibility of speech with regard to their child's hearing loss. Although the diagram was designed for English speaking parents, speech therapists and academic institutions in South Africa also use it to explain hearing loss and its effects to Afrikaans speaking parents as well.

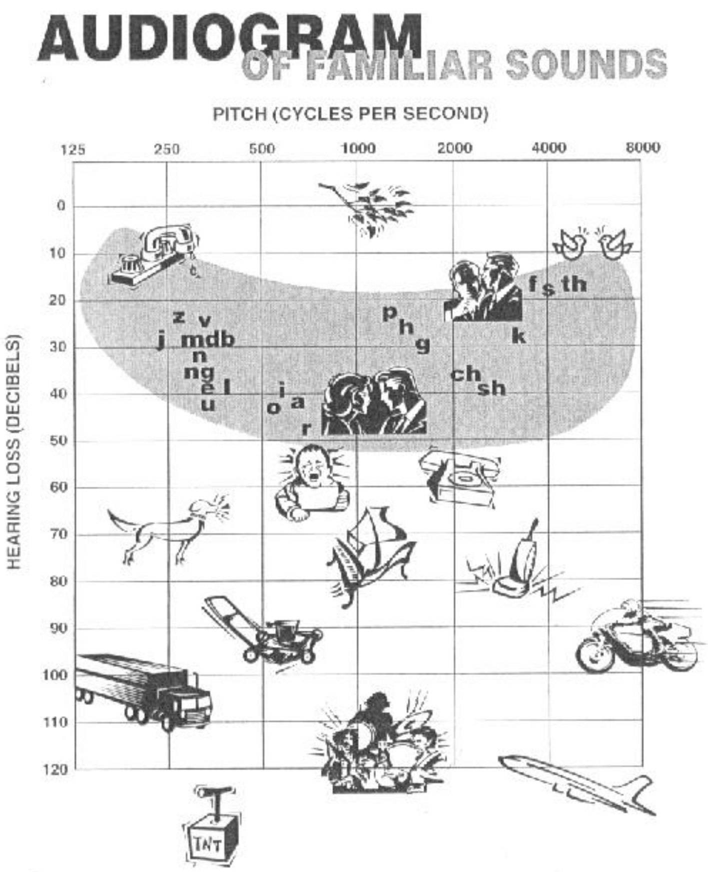


Figure 5: <u>Frequency spectrum of familiar sounds plotted on a standard audiogram</u>

(Northern & Downs, 2002)

2.4. Definition of Hearing Impairment

The degree of hearing loss is almost always important when discussing the effects of hearing loss on child development. A broad variety of definitions and classifications are still in use today (Duijvestijn, Anteunis, Hendriks & Manni, 1999). Hearing impairment is usually described by measures of hearing, such as loss of sensitivity and loss of acuity. It can be measured rather precisely, with results reported in dB or percentage loss of discrimination. When defined medically, hearing loss is categorized at levels from slight to profound. The problem with these definitions, however, is that the words can give a false impression of the level of difficulty the child may face. The disabling effects of a given impairment are not so easily ascertained.

Using medical definitions of hearing loss, Batshaw and Perret (1981) distinguished hearing loss as follows: children with light hearing loss (25-45 dB), moderate hearing loss (45-70 dB), and profound hearing loss (90 dB). Davis and Hardick (1981) stated that hearing loss can be expressed precisely in terms of decibels, speech discrimination scorers, speech reception threshold or pressure in the middle ear. The authors provided a framework which can be used as estimates for the purpose of easy communication and not merely as diagnostic designations: normal hearing (00-15 dB); mild hearing loss (16-40 dB); moderate hearing loss (41-55 dB); moderate to severe hearing loss (56-70 dB); severe hearing loss (71-90 dB); and profound hearing loss (>90 dB).

Du Toit (1981), one of the pioneers of research in this field in South Africa and the founder of the Paedo-Audiological centre at Tygerberg Hospital in the Western Cape, South Africa, used the term ‘hearing impairment’ in his research. He maintained that the terms deaf, hard-of-hearing or partially hearing become obsolete due to development in the area of hearing impairment. He suggested that the most important factor is not the hearing loss, but the degree to which the person has mastered the natural language, speech and communication. Thus there should be two groups of hearing-impaired children:

a) those who as a result of earlier treatment and pre-school rehabilitation programs, have acquired enough natural language, speech and communication to be transferred to a mainstream school;
b) those who did not learn enough natural language and speech and who will be reliant on visual and tactile leads for communication. They may or may not have been identified at an early stage and may or may not have attended a rehabilitation program. These are the children who will need to attend special schooling geared to their particular needs.

While natural language, speech and communication are emphasised by some professionals, a long-standing debate has existed over whether children should be educated orally or by sign language. Those in favour of signing argue that this is the common, natural language of the deaf and signing is thus the only way a deaf person should learn to communicate. Those in favour of the oral approach argue that with sign language, the deaf may be excluded from society, especially in South Africa where deaf communities are in the minority and their rights to an interpreter are not freely available.

In South Africa it has become the established pattern to distinguish between partially hearing children, hard-of-hearing children and deaf children (Kapp, 1991). These classifications determine the education the children receive. The provision of education for the above categories is briefly:

- Category 1: Partially hearing children have a hearing loss less than 35 dB and can be educated in a regular school.
- Category 2: Hard-of-hearing children have a hearing loss between 35 dB and 65 dB. In South Africa, these children are accommodated in schools for the deaf. They will not require the teaching methods used for the deaf and will attend separate classes.

- Category 3: Deaf children have a hearing loss of 65 dB and more. They need to attend schools for the deaf where special teaching methods are employed which mainly make use of visual sense augmented by the auditory sense (Kapp, 1991).

According to Diefendorf (1996) the term deaf describes a person whose hearing loss is so profound that the auditory channel cannot be used as the primary one to perceive and monitor speech or to acquire language. Sound is thus a secondary and supplementary channel to vision or touch. The term hard-of-hearing on the other hand is used to describe an individual who uses hearing as the primary mode for speech development. Some of the indicators which separate the hard-of-hearing from the deaf include: the amount of residual hearing; age at which the hearing loss is detected; the family outlook on hearing impairment; and the effectiveness of early intervention (Diefendorf, 1996).

Hearing loss is generally described in terms of the impact it has on spoken communication (Schirmer, 2001). According to Keith (1996) the guidelines used today by most practitioners looks as follows:

Table 1: Guidelines used to describe the degrees of hearing loss

Hearing level	Descriptor	Impact on communication
-10 to 15 dB	Normal	No impact on communication
16 to 25 dB	Slight	In quiet environments, the individual has no difficulty recognizing speech, but in noisy environments, faint speech is difficult to understand.
26 to 40 dB	Mild	Faint or distant speech is difficult to hear if the environment is quiet. Classroom discussions are challenging to follow.
41 to 55 dB	Moderate	The individual can hear conversational speech only at a close distance. Group activities, such as classroom discussions, present a communicative challenge.
71 to 90 dB	Severe	The individual cannot hear conversational speech unless it is loud. The individual's speech is not altogether intelligible.
91 dB +	Profound	The individual may hear loud sounds but cannot hear conversational speech at all. The individual's own speech, if developed at all, is not easy to understand.

It must be noted that no two individuals have the same pattern of hearing even if they fall within the same category. Their ability to functionally use hearing will also differ from one individual to the other. The above-mentioned criterion have, however, been found to be useful for social, educational and medical purposes. It is not possible to predict language or educational performance of hearing impaired children on the basis of degree of hearing loss alone (Diefendorf, 1996). For the purpose of this study, the researcher will thus use the term hearing impairment as a generic term to refer to all levels of hearing loss, from mild to profound. Of prime importance is that ultimately the child's needs and unique status will transcend any categorical attempt of definition. In the study, hearing loss will be defined as any deviation from normal hearing regardless of the nature, cause or severity. The focus will be on the child's ability to use audition to understand speech, if necessary, with amplification. The framework from Keith (1996) will be used as a guideline to describe the degree of hearing loss, as this is the scale according to which the Carel du Toit Pre-School and most South African practitioners function today.

2.5. Types of Hearing Loss

The various causes of hearing impairment all affect different portions of the ear and hearing mechanism. Hearing losses have thus been categorized as sensorineural, conductive, or mixed (Schirmer, 2001; Woodson, 2001). It is, however, important to acknowledge that such a description of deafness only describes a small part of a whole child.

Most permanent childhood hearing losses are *sensorineural* (Flexer, 1999). This type of hearing impairment is frequently present at the time of birth and implies that the damage to the hearing system lies within the cochlea, in the inner ear. The outer and middle ear may be intact but the inner ear is not receiving the sound, either as a result of not being delivered to and received by the brain, or it is delivered in a distorted manner, or only limited sound is transmitted (Schirmer, 2001). With such a hearing loss, both air and bone conduction thresholds are equally impaired. As a result, a child's ability to discriminate between sounds of differing intensity and frequency is affected (Stewart & Adams, 1997).

The loss of hearing is usually different on all frequencies. In most cases the hearing is poor on the higher frequencies; sometimes it deteriorates gradually, and sometimes abruptly from the low frequencies to the high (Kapp, 1991). Depending on the severity of the loss, a child with this type of hearing impairment will have difficulty coping in noisy situations as the loud sounds can appear to be much louder than they truly are. The child will be able to hear speech because he/she clearly hears the low frequencies but he/she will have difficulty in understanding speech, for, owing to the loss of hearing high-frequency sounds, many words will sound similar.

Sensorineural loss entails damage to the neuro-sensory elements and generally the loss is profound and nearly always permanent and irreversible (Northern & Downs, 2002). Although such a hearing loss is invariably unresponsive to any form of medical or surgical treatment, the child may gain substantial assistance from appropriate amplification. However, even with the amplification, the distortion of the sound caused by the damage to the inner ear cannot be improved (Schirmer, 2001). As can be seen in the figure below, both air and bone conduction deteriorates as the frequency of sound becomes higher.

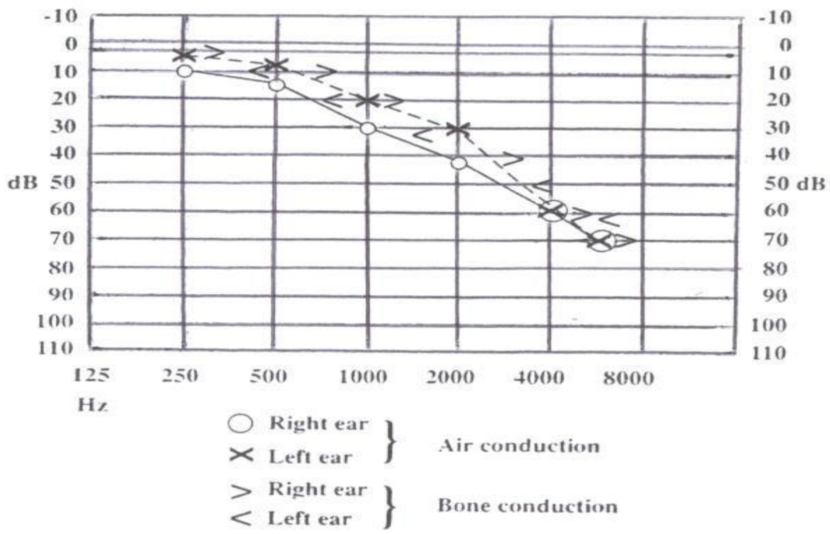


Figure 6: A bilateral sensorineural hearing loss

Conductive hearing loss is the most common type of hearing loss found in children and often goes undetected (Bennetts & Flynn, 2002). The damage occurs in the outer or middle ear, where sound is amplified and transmitted to the cochlea. Such a hearing loss is often caused by disease such as viral infections and recurrent middle ear infections. With a conductive hearing loss, the inner ear is capable of normal function, but the sound vibration is unable to stimulate the cochlea via the normal air conduction pathway (Northern & Downs, 2002). Bone conduction is thus normal while air conduction thresholds are impaired. An individual's sensitivity to all sound, no matter what the frequency, is reduced. Hearing loss is usually in the mild to moderate range of hearing impairment (Stewart & Adams, 1997). The effect of even a slight hearing loss cannot, however, be underestimated. Although some conductive hearing losses resolve spontaneously, most require medical or surgical treatment for hearing to return to normal. As can be seen in the figure below, bone conduction is normal while air conduction is impaired on all frequencies.

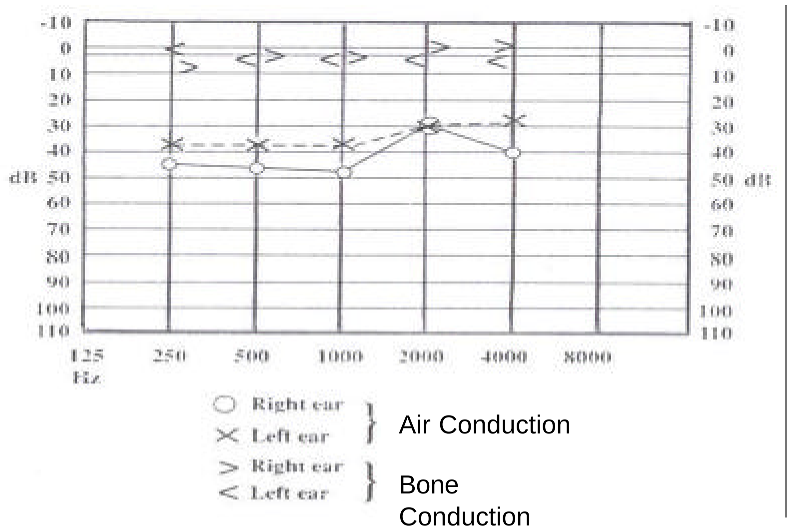


Figure 7: <u>A bilateral conductive hearing loss</u>

When a conductive hearing loss is overlaid on a sensorineural loss, the resulting hearing problem is known as a *mixed hearing loss*. With such a loss, both the air and bone conduction thresholds are impaired, and there is an additional superimposed air-bone gap (Baldwin & Watkin, 1997). This loss is quite uncommon among children. As can be seen in the figure below, air conduction is more severely impaired than bone conduction. Both, however, deteriorate the higher the frequency.

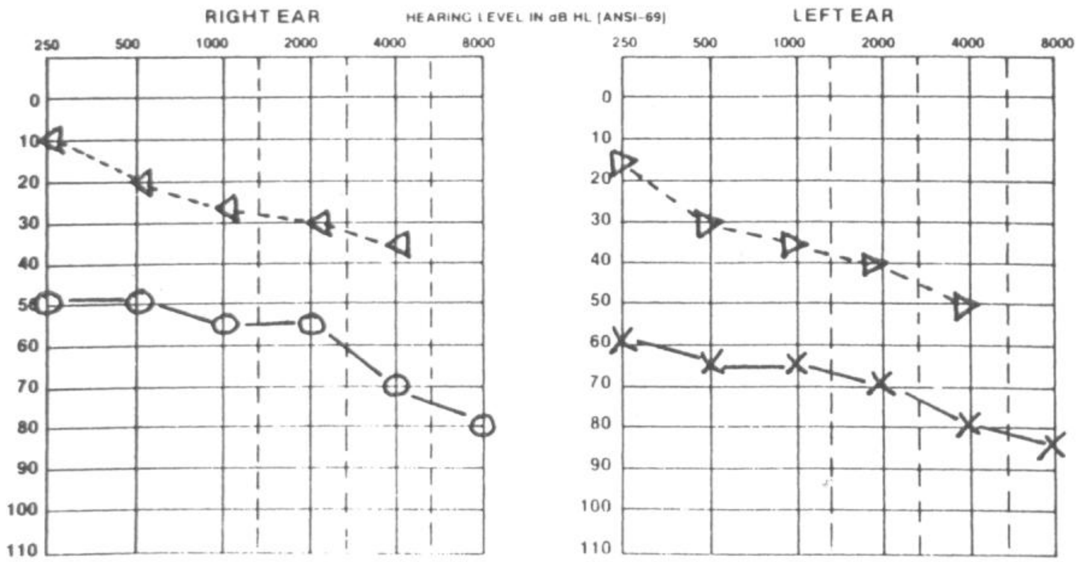


Figure 8: A bilateral mixed hearing loss

Hearing loss can also be unilateral or bilateral (Schirmer, 2001). A unilateral loss is present in only one ear. An individual with such a loss may have difficulty in localizing sounds and listening in noisy or distracting settings, but they generally have no difficulties in hearing and learning spoken language (Schirmer, 2001). A bilateral loss, as the name implies, is present in both ears, but it must not be assumed that the degree of hearing loss in each ear is the same since the degree and intensity of the loss can vary considerably.

2.6. Causes of Hearing Loss

Hearing is a complex process, so it follows that causes of hearing loss are also complicated. However, early detection of hearing impairment, followed by appropriate investigation of the causative factors, gives the best chance of identifying the reasons for the hearing loss (Newton & Stokes, 1999). If the specific cause has been able to be identified, possible predictions can be made as to whether the child's hearing loss will deteriorate.

The causes of hearing loss in children can be divided into two main categories: (a) genetic or hereditary; and (b) environmental or acquired.

Although a large portion of childhood hearing impairment is inherited, a sizeable portion is caused by external factors such as viral infections during pregnancy (Newton & Stokes, 1999). Unfortunately, for many children with permanent hearing impairment, no cause can be found. Recent research has led to the proposal that genetic and environmental factors may often interact to cause hearing loss (Arnos, Israel, Devlin & Wilson, 1996).

Causes of hearing impairment vary with age and from one geographic area to another. Childhood diseases are, for example, common contributors in early life and middle ear infections during school age, especially pre-school years where the immune system is not yet well developed (Moore, Hogan, Kacelnik, Parsons, Rose & King, 2001). In the Western Cape, South Africa, middle ear infections are common due to the wet and cold winters.

Although treatment has helped to prevent deafness, it has also often resulted in deafness (Newton & Stokes, 1999). Due to advanced treatment, premature babies may, for example, survive, but suffer from a hearing loss. The incidence of hearing impairment is therefore neither increasing nor decreasing due to medical advancement (Newton & Stokes, 1999).

The common trend is to divide the causes of hearing impairment into three categories, namely prenatal, perinatal and postnatal. According to Newton and Stokes (1999) over half of all permanent childhood hearing impairments are prenatal in origin.

2.6.1. Prenatal Causes

It is estimated that about half of all childhood deafness is due to *hereditary causes* (Northern & Downs, 2002; Van Laer & Van Camp, 2001). At least 200 types of hereditary hearing loss have been described (McKusick, 1992). Of these, approximately one-third have co-morbid disorders, that is, the hearing impairment is part of a syndrome, while two-thirds suffer only from a hearing loss with no additional physical or mental impairment. Although the time of acquisition of the genetic defect is at the moment of conception, the time of acquisition of the hearing impairment can vary. If the genetic defect is slight, the hearing impairment may not appear until triggered by some causative factor such as illness, drugs or trauma. A high percentage of the hearing impaired population whose cause is listed as unknown are probably the result of recessive inheritance (Arnos et al., 1996). This implies that each parent is normal hearing, but has a gene for hearing loss paired with a normal gene.

Congenital hearing impairments can be the result of *viral infections* contracted by the mother during pregnancy. The exact nature and severity of the damage caused to the developing embryo depends on its stage of development, the most critical period being the first 3 months of gestation. If hearing is affected, it may include both sensory and neural impairments. Research indicates that in present day infections during pregnancy are much less likely to cause childhood hearing impairment because of immunisation (Markman, 1992).

The best-known example of a congenital condition is that of *Rubella* or *German measles*. Maternal rubella infection causes hearing loss in 60 to 80% of cases, with the loss being severe to profound (Chase, Hall III & Werkhaven, 1996). The loss is usually sensorineural in nature and may become progressively worse with time. In addition to the hearing loss, children with congenital rubella syndrome may have co-morbid disorders which could include mental retardation, eye and heart defects, as well as learning difficulties (Kapp, 1991; Stewart & Adams, 1997).

Toxoplasmosis is much less common than rubella. It is usually not obvious at birth but with time manifests itself with progressive blindness, liver disease or epilepsy (Stewart & Adams, 1997). Hearing loss only develops in 10-15% of such children.

A significant number of newborns are affected with the *Herpes Simplex Virus* (HSV). 50 to 80% of the infected neonates die, while those surviving are left with severe, generalised complications (Chase et al., 1996). Herpes Simplex Virus and Cytomegalovirus (CMV) have similar effects. The

Cytomegalovirus is a common virus that can be contracted by the fetus within the uterus, down the birth canal or through breast milk (Schirmer, 2001). The most serious effects occur when the mother has contracted the virus for the first time during pregnancy, rather than when she experiences a reactivation of the virus. 10% of children born with Cytomegalovirus are hearing impaired (Newton & Stokes, 1999). Cytomegalovirus-induced hearing loss is often accompanied by cerebral palsy and mental retardation. Hearing loss may be of delayed onset and is likely to deteriorate over time.

The hearing loss from Herpes Simplex Virus and Cytomegalovirus varies from mild to profound. With South Africa's high incidence of sexually transmitted diseases, one can suspect that a significant number of children may suffer from a hearing loss as a result of the Herpes Simplex Virus or Cytomegalovirus.

There are a number of *medications* used that are known to affect hearing if ingested by the mother during pregnancy. Many drugs that are administered to treat diseases such as cancer and secondary infections resulting from AIDS are ototoxic (Schirmer, 2001).

2.6.2. Perinatal Causes

About 17% of permanent hearing impairment is acquired during the perinatal period (Newton & Stokes, 1999). Lack of sufficient oxygen, infections and excessive bilirubin levels can each be a cause of sensorineural hearing loss. Many children who have acquired their hearing loss as a result of these perinatal causes have high-frequency hearing losses (Newton & Stokes, 1999). Profound hearing loss may be found along with other major disabilities such as cerebral palsy or severe visual problems (Kapp, 1991).

About 9% of the infants born *prematurely* have a sensorineural hearing loss (Newton & Stokes, 1999). Pre-term children are more at risk because of the following reasons: they may have suffered from hypoxia (shortage of oxygen); they may have immature metabolic functions; they may have had a traumatic delivery; they may need to have been resuscitated; and they may spend some time in intensive care in noisy incubators (Newton & Stokes, 1999; Chase et al., 1996).

Incompatibility between the *Rh factor* in the mother's blood and that of the child may cause the mother's system to develop antibodies that destroy the child's red blood cells, leading to severe anaemia and jaundice (Newton & Stokes, 1999). The resulting loss of nutrients to the cochlea, as well as the high levels of toxic pigments in the bloodstream, can produce both sensory and neural hearing impairments. Modern day technology can assess incompatibility and therefore less children have been diagnosed with a hearing loss as a result of this condition.

2.6.3. Postnatal Causes

Of the diseases that can be contracted by children themselves, with hearing impairment as a possible consequence, the best-known example is *meningitis*. It is the most frequent cause of acquired sensorineural hearing loss in childhood (Cherian, Singh, Chacko & Abraham, 2002) and about 10% of children with meningitis suffer a hearing loss when the infection is bacterial rather than viral (Newton & Stokes, 1999). Meningitis annually causes approximately 10 000 cases of hearing impairment in sub-Saharan Africa (Cherian et al., 2002). The hearing impairment is usually bilateral and profound (Stewart & Adams, 1997). As children recover from the illness they may be left with residual deficits ranging from balance, to visual deficits and general cognitive impairments (Schirmer, 2001).

One of the most common causes of congenital deafness in children is *otitis media* (inflammation of the middle ear), which might accompany any illness but commonly results from colds, sinus and allergies (Northern & Downs, 2002). Children have poorly developed immune systems and often suffer from frequent infections, especially during the first 2 years of life. If normal middle ear secretions are unable to drain down the Eustachian tube, the secretions will build up and fill the middle ear with fluid. Bacteria in the middle ear can lead to an immunological reaction which results in an effusion even if an active infection is not present. Unattended otitis media with the formation of puss in the middle ear can end up in a glue ear that erodes the structures of the ear and may consequently cause a hearing impairment. Bottle-feeding where a baby lies flat on his/her back has also been associated with a high incidence of otitis media (Hawler & McCombe, 1995).

Children in South Africa attend playschools from an early age and as a result of the continuous contact with other young children, they are at high risk for middle ear infections. Bess and Humes (1995) found that between 76 and 95% of children experience otitis media at least once before they are 6 years old, while approximately one-third of children experience three or more episodes. The result is a mild to moderate degree of conductive impairment that is usually reversible. However, if left untreated, otitis media can result in a build-up of fluid and a ruptured eardrum, which can lead to permanent conductive hearing loss (Schirmer, 2001).

Otitis media has been classified in the following ways:

- Acute otitis media: This is an inflammatory disorder and usually presents with sudden onset accompanied by severe ear pain, redness of the tympanic membrane and fever.
- Otitis media with effusion, also known as glue ear, serous otitis media or mucoid otitis media: This is the most common form of otitis media, and involves an infection of the middle ear without an infection of the eardrum.
- Suppurative otitis media: This is a late stage of ear disease in which there is an infection of the middle ear as well as a perforation of the tympanic membrane and discharge.

A large number of children with cleft palate suffer from chronic otitis media. About 50% of children with Down Syndrome and most children with Foetal Alcohol Syndrome and cranio facial abnormalities develop chronic otitis media (Hawler & McCombe, 1995).

Measles and/or *mumps* can cause sensory deafness, especially if unusually high fever is involved. Measles rarely causes moderate to severe, bilateral hearing loss (Newton & Stokes, 1999; Stewart & Adams, 1997). Mumps on the other hand usually affects only one ear and the loss is profound. However, after the introduction of the MMR (measles, mumps and rubella) vaccination, which is compulsory in South Africa, hearing loss after mumps is much less common (Newton & Stokes, 1999).

Trauma, which may lead to hearing loss, includes for example a skull fracture that affects the middle or inner ear. Severe head blows and extremely loud noises can cause a conductive hearing loss if the small bones in the middle ear are disrupted (Newton & Stokes, 1999). Many South African children are exposed to physical abuse and violence and one can hypothesise that as a result, a significant number of our children are at risk of suffering from a hearing loss.

2.7. Co-Morbidity of Hearing Impairment with other Medical Conditions

Diversity in the causes of early onset deafness leads to diversity in the development of children with a hearing loss. Researchers have found that many cases of deafness carry with them the possibility of damage to other sensory systems and/or neurological damage (Marschark, 1993). The presence of one structural abnormality increases the probability of additional abnormalities.

Approximately 30% of hearing-impaired children have a disability in addition to a hearing loss (Fortnum, Marshall & Summerfield, 2002). Common co-occurring conditions include mental retardation, significant visual impairment, asthma, arthritis, heart trouble, learning disabilities, attention deficit disorders, emotional or behavioural problems, cerebral palsy and orthopaedic problems (Flexer, 1994; Northern & Downs, 2002; Tye-Murray, 1998).

Table 2 gives some indication of the prevalence of additional disabilities which co-exist with a hearing impairment.

Table 2: Prevalent handicaps for specific aetiologies

Aetiology of hearing impairment	Additional handicap	Prevalence (%)
Prematurity	Mental retardation Visual defect Emotional/behavioural	16,5 25 10,5
Maternal Rubella	Visual defect Cardiac condition	33 33-76
Meningitis	Mental retardation Emotional/behavioural	14,1 8
Rh Incompatibility	Cerebral palsy Visual defect Emotional/behavioural	51,1 25 7
Heredity	Emotional/behavioural	6,2
Perinatal trauma	Emotional/behavioural	10,7
Postnatal trauma	Emotional/behavioural	9,4

(Source: Blennerhassett & Spragins; Johnson, Caccamise, Rothblum, Hamilton & Howard; Vernon; Vernon, Grieve & Shaver, in Bradley-Johnson & Evans, 1991)

2.8. Types of Amplification

The aim in providing amplification for a hearing impaired child is a simple one. Since the development of expressive speech and language skills is dependent on the quality of the auditory signal received, the sound must be amplified to a level which provides the hearing impaired child with access to as much of the speech signal as possible (Smith, 1997). Conversational speech is thus amplified to an optimum listening level within a safe and comfortable range, thereby restoring hearing to as near normal a state as possible. This implies that the amplification system must make soft speech audible, speech and environmental sounds comfortably loud and loud sounds not uncomfortable.

An appropriate form of amplification will have to take into account variables such as the sensory, physical, emotional, intellectual, social and educational needs of the child (Coninx & Moore, 1997). Various types of amplification systems are available and choosing and fitting the most appropriate one for each individual child involves teamwork from professionals such as the audiologist, paediatrician, teacher and the parents of the child.

2.8.1. Hearing Aids for Children

Tremendous technological advances in the hearing aid have been made over the past three decades, which has led to improved fitting, comfort and instrument performance (Northern & Downs, 2002). Hearing aids have three basic components. Sound from the environment enters the hearing aid through the microphone, which changes the acoustic signals into electrical signals. The electrical signal is increased in intensity through an amplifier. The amplified electrical signal is then passed through the receiver, which changes the signal back into amplified acoustic sound and sends it to the user's ear canal through some type of ear mould. A small battery powers the hearing aid system.

Various types of hearing aids are available and should be chosen according to the child's special needs. *Ear-level hearing aids* are the amplification instruments of choice for children (Northern & Downs, 2002; Smith, 1997). They include behind-the-ear (BTE) models, as well as in-the-ear (ITE) models, in-the-canal (ITC) and completely-in-the-canal (CIC) hearing instruments. These aids may be used for all degrees of hearing loss, from mild to severe.

According to Northern and Downs (2002) b*ody-type hearing aids* (Figure 9) are reserved for children with congenital anomalies of the pinna and ear canal, children with multiple handicaps in addition to hearing loss and other special situations where ear-level hearing aids cannot be used.

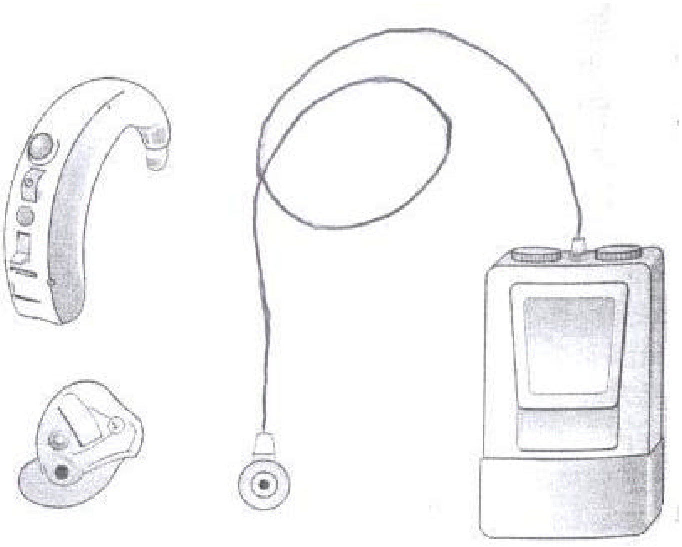


Figure 9: The different styles of hearing aids

Extended-frequency hearing aids provide greater low-frequency acoustic stimulation to enable hearing-impaired children with residual hearing in the low frequencies to use amplification.

Bone-conduction hearing aids (Figure 10) are used in selected children with significant conductive hearing loss who cannot for whatever reason use an air-conduction hearing aid. Such a fitting is not permanent as successful surgical intervention may alleviate the cause of the conductive-type hearing problem and traditional air-conduction hearing aids may be fitted.

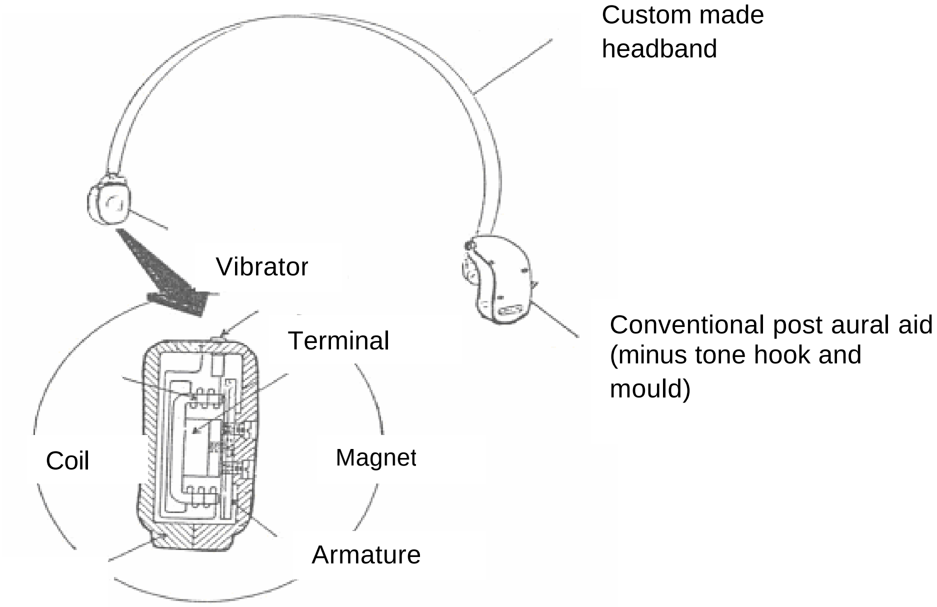


Figure 10: A bone conduction hearing aid

Hearing aids amplify sound, making sound louder. However, the amplification of sound produced by the most sophisticated hearing aids may not offer much benefit to people with severe to profound hearing loss. No matter in what manner the sound is amplified, a profoundly hearing impaired ear cannot process the information due to the damaged hair cells. Thus one of the most dramatic and exciting developments in hearing and deafness has been the cochlear implant. A cochlear implant does not make sound louder, but provides useful sound information by directly stimulating the surviving auditory nerve fibres in the cochlea and thus allowing the individual to perceive sound via electrical stimulation.

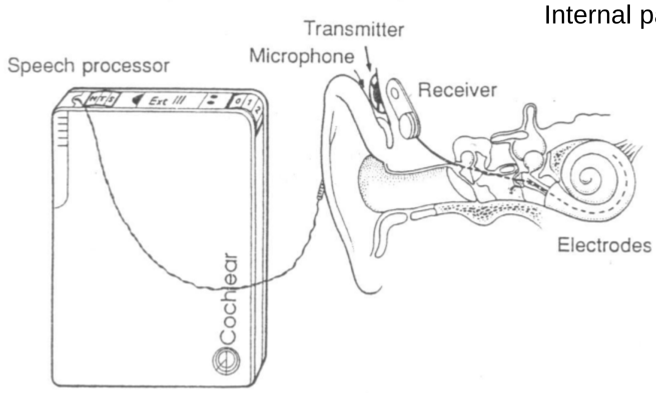
2.8.2. Cochlear Implants

A cochlear implant is an electronic device that performs the function of the damaged or absent hair cells that line the cochlea by providing electrical stimulation to the remaining nerve fibres (Figure 11). The damaged ear is thus bypassed and the auditory nerve is stimulated directly. With careful selection of candidates, precise fitting, support from parents and educators and a comprehensive aural habilitation programme, many more children with profound hearing loss are able to be helped (Kelsay & Tyler, 1996; O'Donoghue, Nikolopoulos, Archbold & Tait, 1999).

A complete evaluation for a cochlear implant includes medical, audiologic, speech and language and psychological assessments. For a child to be considered a candidate for a cochlear implant, the child must have a reasonable chance to perform better with a cochlear implant than with any present sensory aid. The minimum requirements for children to be considered for cochlear implantation by the South African Cochlear Implant Team consisting of ENT specialists, speech therapists, audiologists and teacher therapists are summarised below:

- The child must suffer from a profound sensorineural hearing loss in both ears
- The child must be 18 months and older
- The child must receive little or no useful benefit from hearing aids or vibro-tactile apparatus
- No radiological contraindications should be present which would prevent the electrical array passing through the cochlea or the placement of the receiver-stimulator on the mastoid bone
- The family must display a high level of motivation and realistic expectations
- Placement of the child in an educational institution that places emphasis on auditory development is essential.

Internal parts of the system



External parts of the system

Figure 11: <u>The present cochlear implant apparatus</u>

Sounds are picked up by the small, directional microphone located in the headset at the ear. A thin cord carries the sound from the microphone to the speech processor, a powerful miniaturized computer. The speech processor filters, analyses and digitises the sound into coded signals. The coded signals are sent from the speech processor to the transmitting coil. The transmitting coil then sends the coded signals as FM radio signals to the cochlear implant under the skin. The cochlear implant delivers the appropriate electrical energy to the electrode array, which has been inserted into the cochlea. The electrodes along the array stimulate the remaining auditory nerve fibres in the cochlea. The resulting electrical sound information is sent through the auditory system to the brain as sound and a sensation of hearing is experienced. The length of time between when the microphone picks up a sound and when the brain receives the information is very short, just microseconds, so the user hears sounds as they occur.

The amount of benefit from cochlear implants varies greatly amongst children. A child’s ability to use the cochlear implant for communication seems to depend on factors such as the amount of time the device is used each day, the extent to which sound is integrated meaningfully into the child’s daily life, the habilitation services the child receives, the degree of parental involvement and support, the degree of remaining auditory nerve survival, the duration of the deafness and the age of implantation (Northern & Downs, 2002).

Children with cochlear implants are more likely to have a postnatal aetiology and less likely to have disabilities concerned with learning or cognition (Fortnum et al., 2002). In general, better candidates for cochlear implantation are those children with acquired deafness, those who have been deaf for only a short time and those from an auditory-oral educational training background (Northern & Downs, 2002).

Cochlear implantations provide potential benefit for profoundly hearing impaired children with regard to their auditory skills, speech production and language acquisition (Kelsay & Tyler, 1996). However, such an apparatus has its limits. The cochlear implant does not normalise hearing and the sound generated by the implant differs from normal hearing. Individual children differ widely in the auditory perceptual benefit that they receive from the implant. Therefore, despite the evidence of both the safety and efficacy of cochlear implantation, there remain questions and concerns to be answered. The questions include amongst others, the ability to predict outcomes from implantation and what level and type of rehabilitative support is appropriate. Concerns include long-term technical problems, long-term funding arrangements and the availability of experienced staff and centres (Archbold, 1997). It is likely that as more experience is gained, more technological advances will be made and further research can be conducted.

2.9. Methods of Learning Language/Communication Options

Deaf education in sub-Saharan Africa originated in the 19th century, primarily through efforts by hearing European missionaries, but education became available to only a fraction of the deaf population (Kiyaga& Moores, 2003). In the 20th century, Andrew Foster, the deaf African American missionary established 31 schools for the deaf in the region, training a generation of deaf leaders, and introducing his concept of total communication. Nigeria, Kenya, Uganda and South Africa have to date provided leadership in deaf education (Kiyaga & Moores, 2003).

One of the most difficult decisions parents have to make once their child has been diagnosed with a hearing loss, is the choice of communication be it oral or total communication. Li, Bain and Steinberg (2003) found that the child's extent of a hearing loss was the most influential decision factor. Further the researchers found that parental cognitive-attitudinal factors were important in the inclination to favour an oral approach if they believed that a hearing loss can and should be rectified and if they desired the child to be able to speak.

According to Lynas (1999) the hearing impaired child has the normal human capacity to develop language but can be prevented from realizing this potential by not having access to the speech of others. There are, broadly speaking three communication approaches which differ significantly in what they entail and in their overall objectives. Depending on the child's developmental progress and level of hearing, a decision will have to be made for the hearing impaired child on behalf of his/her parents and significant professionals involved with the child. Most professionals agree that no single methodology works for all hearing impaired children (Northern & Downs, 2002). A brief discussion of the three approaches follows below.

2.9.1. Auditory-Oral Approach

The Carel du Toit Centre from where the sample for this study has been drawn, uses this approach in teaching hearing impaired children to communicate. The goal of the auditory-oral approach is communication through speech (Lynas, 1999). This implies that the deaf children's residual hearing is exploited by amplification so that the auditory processing parts of the brain can be activated and language can develop. The children are therefore educated in regular learning and living environments which will enable them to become independent and participating adults. The auditory-oral approach is based on experiential learning and relies on speech reading and audition to learn language. This method totally excludes the use of any natural signs or gestures (Northern & Downs, 2002).

A key aspect of the auditory-oral approach is that the children are exposed to good-quality language (Lynas, 1999). All children need language experience if they are to acquire language and conceptual thought. It is thus important that the spoken language surrounding the hearing impaired child is relevant to his/her needs and interests and the language is related to the child's focus of attention. "The more the adult offers communication that is relevant to the hearing impaired child's interests, the more, so it is claimed, the child will attend to speech and the more responsive and interactive he will become" (Lynas, 1999, p. 101). Parental involvement is thus vital with regard to consolidation of language.

As the child perceives the speech sounds as symbols of language and a means of communication, the process of language acquisition gets under way. The foundation for literacy and hence for educational development is laid once the hearing impaired child can communicate through spoken language.

According to Lynas (1999) the oral approach seems to offer the widest educational opportunities in terms of academic achievement. The approach, however, requires skill, commitment and time on the part of parents, professionals and the child. Over the years it has become evident that if parents do not participate in the programme, the child's progress is stunted. Research has shown that not all children can be successful learning language through amplification, speech reading and auditory training (Schirmer, 2001). For example, some children have no measurable hearing for one reason or another. If the child is severely multi-handicapped, he/she may find it difficult to learn language. For the hearing impaired child, learning to appreciate that what at first might seem like faint muffled noises are actually symbols of communication, takes time (Lynas, 1999).

It seems that all investigations to date are fraught with bias, with researchers biased toward oralism conducting studies that showed the benefits of oralism, while those biased toward sign language, showing the benefits of sign language.

2.9.2. Total Communication (TC)

The basic premise of TC is to use all methods of communication that is, sign, gesture, finger-spelling, speech, hearing, lip movements and facial expression (Lynas, 1999; Northern & Downs, 2002). The idea is that audition and speech is supported by visual communication so that an easy, free, two-way communication can take place between the child and his/her family, friends and teachers. TC is a flexible approach and sensitive to each child's individual needs. Signs are used in conjunction with speech to clarify the spoken language, to lessen ambiguity and to emphasize new words.

Some advantages of the approach are that signing is global and some children require much stimulation to learn. However, overall TC is having a hard time at present as critics have stated that the hoped-for-results in relation to overall language and educational achievements have not been produced (Lynas, 1999).

2.9.3. Bilingual Approach

Bilingualism has attracted much recent attention and can be seen as a reaction against the auditory-oral and TC approach. According to bilingualists, sign language used by hearing impaired people within their own group, can meet the linguistic and communication needs of hearing impaired children. The goal is for the child to be at the same level of language as the hearing child is in speech at the age of five (Lynas, 1999). Bilingualists believe that since speech is an unattainable goal for hearing impaired children, no time should be 'wasted' in teaching them speech and if the child has some natural ability to acquire speech, he/she will use speech in some contexts.

The rationale for this approach has a strong ideological component. Not only is it difficult to learn sign language, it is also problematic to implement education in sign language. Although the deaf children will develop a distinct deaf identity, they and family members will always be aware of their 'otherness'. In South Africa, an estimated 40% of the hearing impaired population has accepted sign language as their first language (Deaf Federation of South Africa, 2003). Seeing that the deaf community in South Africa is relatively small and diverse, the hearing impaired child may feel isolated in his/her community.

No fail-safe, success-guaranteed method exists for educating hearing impaired children, though throughout history various methods have been proposed as the pedagogical solution (Schirmer, 2001). In the 1960s and 1970s, total communication was considered to be the answer. In the 1980s and 1990s bilingual education was seen as the solution. With the increase in cochlear implants, greater number of children are being educated orally-aurally and this approach has seen renewed interest. Ultimately, professionals must recognise that only a range of approaches can meet the needs of a range of hearing impaired children.

2.10. Chapter Overview

This chapter discussed the nature of hearing and hearing loss, causes of hearing loss, prevalence in the population, and approaches available for bringing sound to individuals who are hearing impaired. It seems critical to keep in mind that hearing impaired individuals come in all ages, genders, ethnicities, races and socio-economic status groups. Some hearing impaired children are born with a hearing loss and some acquire it later in life. Some are severely and profoundly hearing impaired, while some have a mild or moderate hearing loss. Knowledge of the fundamentals of deafness is essential for understanding each hearing impaired child as a unique and gifted child. Furthermore, from the discussion it is evident that early identification and intervention is essential in promoting optimal development of the hearing impaired children and Chapter 3 will thus focus on child development and developmental assessment.

CHAPTER THREE: CHILD DEVELOPMENT

3.1. Introduction

This chapter focuses on the psychological assessment of infants and young children. Firstly, child development will be discussed, emphasising the specific development of the pre-school child. Secondly, the concept of developmental assessment will be explored. This will be followed by a brief description of the assessment of children together with the frequently used developmental measures. The aim of this synopsis is to emphasise the need to have an accurate, comprehensive assessment tool for hearing impaired pre-school children.

No two children's development are alike because of differences in temperament, culture, gender, socio-economic status and an infinite host of other factors which include the style of parenting and the degree of stimulation received within the home environment (Trawick-Smith, 2000). According to Santrock (2001) each child develops in certain ways like all other children, like some other children and like no other children. Consequently psychologists who study child development are drawn to the shared as well as unique characteristics of each child. Davies (1999) stated that gaining a working knowledge of development, includes knowing salient tasks and abilities, as well as ways of thinking, communicating and behaving that characterise a given age.

Development has broadly been defined as patterns of change over time which begins at conception and continues throughout the life span (Keenan, 2002). Mussen, Conger, Kagan and Huston (1984) on the other hand have defined development more specifically, as the "orderly and relatively enduring changes over time in physical and neurological structures, thought processes and behaviour" (p.4).

Hook (2002) broadened the concept of development in children by incorporating transactions between the child and his/her environment. The author stated that development occurs in various domains, such as the biological (changes in our physical being), socio-emotional (changes in our social relationships, emotions and personality) and cognitive (changes in our thought, intelligence and language). These spheres of development are intertwined and are mutually dependent; they intersect and combine in such a way that they cannot be separated from one another. Santrock (2001) highlighted this interdependence by stating that socio-emotional processes shape cognitive processes, cognitive processes promote or restrict socio-emotional processes and biological processes influence cognitive processes. Although it is useful to study the various processes involved in child development, of prime importance is to keep in mind that one is studying the development of an integrated child who has only one interdependent mind and body.

According to Kotras (1998) human development is studied for the following reasons: (a) to understand changes that appear to be universal; (b) to explain individual differences among children; (c) to understand how children's behaviour is influenced by the context or situation in which they live; and (d) to identify possible developmental delays as early as possible and in so doing maximise treatment intervention. Studying human development will thus provide insights into how children perceive, understand, process, recall and learn aspects of the world.

An important feature of developmental psychology is that it applies both to individual development of a specific child or person as well as to the developmental norm for a wider group of people (Hook & Cockcroft, 2002). Developmental norms refer to the average ages of certain phenomena, for example, when a child would say his/her first word. These norms are merely averages and not absolutes. Although the researcher will refer to developmental norms in the study, individual differences will be acknowledged and only when the deviation from the norm is extreme, will there be cause to consider the child's development as being advanced or delayed.

A number of developmental issues have been raised in the study of child development. An important question, which continually confronts the researcher, is how to best characterise the nature of developmental change. Keenan (2002) found that there are two contrasting positions; firstly, development is viewed as a *continuous* process and secondly, development is viewed as being *discontinuous* in nature. According to the first position, development is conceived of as a process of a gradual accumulation of behaviour, skill or knowledge. To this end development proceeds in an orderly fashion with each change building on the previous abilities. In contrast, however, the second position holds that new behaviours, skills or knowledge emerge in an abrupt or discrete fashion. For example, the young pre-linguistic infant is different to the pre-schooler who can speak well.

Another issue, which has generated the most controversy according to Keenan (2002), is the *nature* versus *nurture* issue. Nature refers to the position that our genetic inheritance influences development. In contrast, nurture holds the position that the environment is primarily responsible for developmental growth. Although this debate has raged for centuries, most contemporary developmental psychologists have accepted the fact that the interaction between hereditary and environmental influences is so complex that it is senseless to regard one of the two as more important (Louw, Louw & Schoeman, 1995). To accept the complexity of the nature/nurture interactions is to accept that their effect on the individual differs from person to person and as such there can be no fixed formula for predicting the effect of hereditary or environment on a specific person (Louw et al., 1995). According to Hook and Cockcroft (2002) the critical question is not which factor, hereditary or environment, is responsible for behaviour, but how these two factors interact so as to propel us along our developmental paths.

Most developmentalists recognize that it is unwise to take an extreme position on any of the above-mentioned issues. These aspects after all characterize our development through the entire human life span (Santrock, 2001).

The development of the pre-school child is pivotal in this chapter as the sample falls within this specific age group. Various areas of development will be discussed below with an emphasis on the development of hearing impaired pre-school children.

3.2. The Development of the Pre-School Child

As relatively newcomers in this world, pre-schoolers often demonstrate their thinking in ways that are both amusing and thought provoking. According to Craig (1996) during this period young children change from ‘magicians’, who can make things appear by turning their heads or disappear by closing their eyes, to concept forming, linguistically competent realists. They discover what they can and cannot control; they try to generalize from experience; their reasoning changes from simple associations to the beginnings of logic; and they acquire the language necessary to express their needs, thoughts and feelings.

The areas of general development in young children can be divided into different domains, namely, physical and motor development, socio-emotional development and cognitive development. These domains were recognised and used by Ruth Griffiths (1970) when she developed the Griffiths Scales of Mental Development. Separating physical-motor and perceptual development from cognitive development in pre-school children is difficult as almost everything a child does from birth onwards lays the base, in some way, not only for later physical-motor skills but also for cognitive processes and social and emotional development (Craig, 1996). Understanding the development of pre-school children in these specific domains will, however, assist in interpreting test results and in understanding their behaviour and overall functioning in their environment.

3.2.1. Locomotor Development

In contrast to the extremely rapid growth during the first and a half years of life, the pre-school years are characterised by a more stable, slower increase in height, weight and muscle tone (Craig, 1996; Trawick-Smith, 2000). By the age of 5 years, the brain is nearly adult size, weighing 90 percent of its adult weight. Brain lateralisation is fully established and the child begins to show preferences for using one hand and foot over the other (Trawick-Smith, 2000).

Early physical and motor development follows a predictable pattern. By 7 months a baby begins to crawl and by 10 months the infant crawls on all fours. Between 12 and 14 months the child can walk without support. During the pre-school years dramatic changes are seen in the development of gross motor skills, which refer to capabilities involving large body movements such as running, hopping and throwing (Craig, 1996). In contrast, fine motor skills, which involve the refined use of the hand, fingers and thumb, develop more slowly with the maturation of the neuromuscular mechanisms.

Research has found that boys are more competent with regard to their gross motor skills as they lose baby fat and acquire muscle tone more quickly than girls (Santrock, 2001). Girls, in turn, are more competent at fine motor activities because those areas in the brain responsible for perceptual-motor abilities are more fully developed in females during this period. The table below provides a summary of the gross and fine motor abilities children can usually perform by the age of 7 years.

Table 3: Gross motor and fine motor abilities acquired by normal pre-school children by the age of 7 years

Gross motor skills	Fine motor skills
▪ Walk up and down stairs, alternating feet ▪ Walk in straight and circular lines ▪ Balance while walking on tyre or balance beams ▪ Climb ladders, alternating feet ▪ Run with both feet leaving the ground ▪ Stop, start and change direction quickly when running ▪ Leap of a climber and land on both feet ▪ Hop on one foot for 10 or more repetitions ▪ Gallop, using one lead foot ▪ Ride tricycles using the pedals ▪ Throw objects using the whole body and stepping forward with the leg opposite to the throwing arm ▪ Kick object using bent knee and a back and forward swing ▪ Swing on a swing independently	▪ Eat with a fork and spoon ▪ Spread food with a knife ▪ Put on clothes and shoes independently ▪ Button large buttons on clothing ▪ Zip and unzip clothing ▪ Finger paint ▪ Sculpt with clay ▪ Cut with scissors ▪ Manipulate with accuracy the small pieces of puzzle or pegboard ▪ Grasp a pencil with thumb and fingers ▪ Create representational drawings, including head with facial features ▪ Write some primitive letters or one's name ▪ Coordinate hand and arm movements with the senses such as vision, hearing and touch

(Trawick-Smith, 2000)

According to Trawick-Smith (2000) vision and hearing often affect motor ability. Findings, however, by Dummer, Haubenstricker and Stewart (1996) reveal that hearing impaired children show a typical sequence of motor skill acquisition, similar to that of hearing children.

3.2.2. Personal-Social Development

The pre-school years are a formative period for the development of positive feelings towards one's self, others and the world. Children who are nurtured, encouraged and accepted by adults and peers will tend toward emotional health, while children who are abused, neglected or rejected, are at risk when it comes to social and mental health difficulties (Craig, 1996).

The work of Erik Erikson (1965) has long guided teachers, mental health professionals and parents in understanding the emotional development of young children. Erikson (1965) believed that humans must develop through eight 'ages' of emotional growth if they are to feel competent and self-fulfilled.

Each age is characterized by an emotional struggle between two polar internal states, one negative and one positive. According to Erikson (1965), the key struggle in the pre-school years is *initiative* versus *guilt*. The children, who have previously developed a strong sense of autonomy, will desire to take action and assert themselves. They will wish to create, invent, pretend, take risks, and engage in lively and imaginative activities with peers. When adults encourage such divergent activities and avoid criticism or excessive restriction, a child's sense of initiative will grow; when children are led to believe their efforts are wrong, they will develop a sense of guilt. Although feelings of guilt have a positive role in development in that they lead children to assume responsibility for their own behaviours, Erikson argues that overwhelming guilt inhibits emotional growth.

According to Scheetz (2001) hearing impaired children may be more restricted at this specific stage of emotional development due to their parent's control and overprotection. They may not receive the same sense of freedom that the hearing child has, restricting their activities and freedom to explore. The lack of communication may erode their curiosity and their endless questions may go unasked and unanswered. Due to the very nature of the disability, the children may not be encouraged to experiment with their imagination during this stage. Therefore, many of the emotional developmental experiences characteristic of this stage may not be afforded to hearing impaired children if the parents/caregivers and/or teachers do not make conscious efforts to provide the children with these opportunities (Scheetz, 2001).

One way that initiative manifests itself in the developing child is through energetic interactions with peers. There seems little doubt that the mother-child bond is fertile ground for the acquisition of interpersonal behaviours (Pressman, Pipp-Siegel, Yoshinaga-Itano, Kubicek & Emde, 1998). Hearing mothers with hearing impaired children have been found to be more intrusive, more rigid, more negative, and less likely to comment on and respond to their children's focus of attention or topic choice (Pressman et al., 1998). These types of behaviours may lead to insecure attachment between mother and child, which in turn may affect the hearing impaired child's interactions with peers. References are freely made about the hearing impaired child's labile emotions which are manifested in temper tantrums and rebelliousness. This may, however, be a way that the child tries to cope with his/her frustrations (Kapp, 1991).

According to Luterman (1999) the emotional effects of a hearing loss on a child are incredibly complex and can depend largely on how well the parents cope with the impairment, as well as the educational methodology and setting the child is exposed to. A strong parental relationship, parental involvement and a positive attitude will have a positive influence on the security and emotional well-being of the child and family as a whole. For the sibling of a hearing impaired child, the emotional effect seems to depend on how well the parents cope with the disability (Luterman, 1999). The quality of parenting skills and interaction with siblings will serve as a basis for healthy interactions outside the home environment. Kapp (1991) stated that emotional problems are not necessarily closely associated with hearing impairment as such, but rather with the way in which others, and especially parents, react to the child's hearing disability. It seems likely that the availability of more diverse social, linguistic and cognitive experiences offered to children at pre-schools can only enhance the flexibility of young hearing impaired children to deal with present and later social interactions.

3.2.3. Cognitive Development

To Piaget the pre-school years are a transitionary period in cognitive development. Young children gradually leave behind the very early thought processes of infancy, which were tied exclusively to the immediate concrete world. They can now think beyond objects or people which are immediately before them and are able to reflect on things that they cannot see, hear, touch or act upon. They can imagine objects or people which are not present, contemplate future events and recall past ones. However, their reasoning is still hampered by several mental limitations, the most pronounced being a heavy reliance on perception and action (Trawick-Smith, 2000).

Piaget provides rich descriptions of pre-schooler's thinking, or what he called *preoperational thought*. This period lasts from about ages 2 to 7 and is divided into two parts – the *preconceptual stage* (from ages 2 to about age 4) and the *intuitive*, or *transitional*, stage (from about ages 5 to 7). The preoperational stage is highlighted by increasing use of symbols, symbolic play and language (Craig, 1996), thus providing the mind with greater flexibility.

Pre-schooler's thought processes are limited by five important characteristics. Firstly, their thinking is *concrete* – they are concerned with the here and now and with physical things they can represent easily. Secondly, their thinking is *irreversible* – that is, events and relationships occur in only one direction. Thirdly, their thought is *egocentric* – centred on their own perception, so that they are unable to take into account another person's point of view. Fourthly, preoperational children's thoughts tend to be *centred* on only one physical aspect of an object or situation. Finally, they focus on *present states* – they judge things according to their appearance in the present, not on how they came to be that way.

Since the time that Piaget developed his theory about how children think, a number of developmental psychologists have looked at children from different perspectives. Unlike Piaget, who viewed children as solitary figures involved in the construction of knowledge, Vygotsky believed that the child's social environment is an active force in their development, working to mould the child's growing knowledge in ways that are adaptive to the wider culture (Keenan, 2002). Vygotsky provided the concept of the zone of proximal development (ZPD) in which children develop through participation in activities slightly beyond their competence, with the assistance of more skilled individuals. Vygotsky used ZPD to refer to the difference between the child's actual developmental level and the potential level guided by adults or older peers.

Vygotsky believed play to be a primary means of moving children toward more advanced levels of social and cognitive skills. He reported that pretend play stimulates development by assisting children to learn that objects can be separated from their normal referents and that they can stand for other things. In addition, play helps children learn about the social norms that are expected of people. Pretend play is thus an important context in which children learn about the social world.

Children with hearing impairments are less likely to engage in pretend play because they symbolise less with objects and participate in joint make-believe with peers less often (Trawick-Smith, 2000). A problem for hearing impaired children is an inability to engage in sophisticated communication necessary to carry out elaborate pretend play. Often negotiations are involved in pretend play and hearing impaired children have trouble participating in such negotiations – not only are they less able to understand their peers' comments, they are likely to have communicative challenges that make self-expression difficult.

Research that has focused on specific aspects of cognitive development of hearing impaired children has yielded contradictory results. The cognitive development of hearing impaired children has typically been studied by using Piaget's developmental tasks (Schirmer, 2001). Piaget believed that language is an aid to the actualisation of thought and insufficient language or a total lack of it, will therefore hamper the proper development of thought (Kapp, 1991). Rittenhouse and Blough (1995) proposed that profoundly hearing impaired children do exhibit cognitive differences, which are the result of language delay and experiential deficit and not cognitive capacity. Research, however, from the 1960's has consistently shown that hearing impaired children progress through the same stages of cognitive development and perform similarly as hearing children, but somewhat later on certain tasks (Cates & Shontz, 1990b). Naglieri, Welsch and Braden (1994) support this view stating that although hearing impaired children are known to have deficits in vocal language, they are believed to have relatively intact cognitive abilities.

Marschark (1993) stated that there seems to be marked differences in the processing strategies employed by hearing and hearing impaired children that might provide both advantages and disadvantages for hearing impaired children in various domains. Hearing impaired and hearing children may differ either in the attentional strategies devoted to cognitive processing or in functional characteristics of their short-term memories. Marschark (1993) believes that the differences in the abilities of hearing impaired and hearing children to retain or integrate verbal and nonverbal information over short periods, coupled with less experience in considering alternative solutions to problems, may have implications for social, as well as cognitive and linguistic functioning.

Regardless of whether such divergence represents differences or deficiencies relative to hearing peers, alternative information-processing styles are likely to effect differences in performance in academic settings, with implications for achievement and success across a variety of domains. When the individual's internal mental structures function properly, when thought processes are stimulated, and when the environment is conducive to cognitive development, both hearing impaired and hearing children will experience growth in their abilities to process information. Hearing impairment on its own does not prohibit cognitive growth (Scheetz, 2001). However, the ramification of this sensory deficit and the cause of the hearing impairment may create an environment of lower educational and behavioural expectations, restricted opportunities for social interactions, a sense of isolation and possible additional deficits such as poor eye-hand coordination or mental retardation. In turn, these factors may impinge on the hearing impaired child, preventing him/her from developing to his/her fullest ability. It is thus of utmost importance that hearing impaired children are exposed to experiences similar to hearing children and that they are exposed to as much stimulation as possible so that their sensory deficit does not become a restricting factor in their development.

Language development forms part of a child's cognitive development and since this study focuses on hearing impaired children, specific emphasis will be placed on their development of language.

3.2.3.1. Language Development

Throughout the pre-school years, children are rapidly expanding their vocabularies, their use of grammatical forms and their understanding of language as a social act (Craig, 1996). Children learn language from individuals who talk to them from virtually the moment they are born. Language is acquired through incident and direct learning. Incident learning takes place when parents and siblings engage in conversation with the child, while directed learning takes place through, for example, story reading. Language is easily learnt if it is used consistently by significant others in conversation with the child, and when the child has full access to the language. Delay or failure of normal language development is not a rare situation in childhood and may be due to a variety of reasons, hearing undoubtedly playing a leading part in the language acquisition process (Psarommatis, Goritsa, Douniadakis, Tsakanikos, Kontrogianni & Apostolopoulos, 2001).

Many researchers have proposed that the pre-school years (until ages 5) may be a critical period for language acquisition (Santrock, 2001; Serbetcioglu, 2001). During the pre-school years, most children gradually become sensitive to the sounds of spoken words. On average, hearing children demonstrate receptive comprehension of single words between 8 and 10 months of age (Luterman, 1999). By the age of 6 years, a child's vocabulary ranges from 8 000 to 14 000 words.

Often one assumes that hearing impaired children's' language will be delayed because hearing is such an important tool for learning language. Serbetcioglu (2001) as well as Tibussek, Meister, Walger and Foerst (2002) stated that in order to develop verbal communication skills, an infant nervous system needs sound stimuli, especially human speech, in the early and critical learning period of life. Great differences of opinion exist regarding the language potential of hearing impaired children. Schirmer (2001) believes that hearing impaired children have the same cognitive ability to learn language as children with hearing. This cognitive ability must, however, be stimulated for development to take place. On the other hand, some argue that the ability to learn language is related to the level and cause of hearing loss. Even a mild hearing loss can interfere with the normal development of speech and language because the child has difficulty in learning higher order concepts (Serbetcioglu, 2001).

Stewart and Adams (1997) summarised all the factors that govern the effect of hearing loss on speech and language development as follows: (a) the type of hearing loss; (b) the age of onset; (c) the age of diagnosis; (d) amplification; (e) acceptance of hearing aids; (f) parental attitude; (g) the presence of additional challenges such as visual impairment or physical disability; (h) the child's personality, intelligence and emotional development; (i) the educational input the child receives; and (j) if there is a difference between the language used at home and at school.

Language development involves the acquisition of various skills such as receptive and expressive skills, phonological development, vocabulary skills and pragmatic language skills. Focus will now be placed on how these skills may be affected in hearing impaired children.

3.2.3.1.1. Receptive and Expressive Language Skills in Hearing Impaired Children

Carney and Moeller (1998) postulate that children with hearing loss have problems accessing constant and consistent information from the environment. This the authors say results from poor early learning experiences which, in turn, creates a weak foundation for forming language rules and developing word knowledge and vocabulary skills. Borg, Risberg, McAllister, Undemar, Edquist, Reinholdson, Wiking-Johnsson and Willstedt-Svensson (2002) state that children with hearing impairment have a delayed language development. These researchers found that the delay is greater in children with larger losses and tends to decrease with increasing age. Other studies have, however, indicated that most children with normal cognitive abilities, who have been identified as hearing impaired before 6 months of age, who receive immediate and appropriate intervention services and who do not have disabilities in addition to the hearing loss, developed language skills within normal limits in early childhood (Mayne, 1999). Yoshinaga-Itano (2000) states that the early identified children maintain age-appropriate language skills from 12 months to 3 years of age, regardless of degree of hearing loss, gender, ethnicity, socio-economic status, age at testing, or mode of communication. Preliminary data on children aged 3 to 6 years indicate that these findings from the infant-toddler period are consistent through the pre-school years (Yoshinaga-Itano, 2000).

Receptive and expressive language skills of later-identified children are one standard deviation lower than those of early-identified children (Yoshinaga-Itano, 2000). Sedey and Lyders-Gustafson (1998) studied children with an average age of 32 months and demonstrated significant differences in receptive language between children with mild hearing loss in comparison with children with moderate through to profound hearing loss. The study further demonstrated significant expressive language differences between children with mild, moderate to severe and profound hearing loss.

From the above mentioned facts, it can be concluded that hearing impaired children who suffer from a mild hearing loss and who are identified early and receive early intervention, will more than likely develop age appropriate language skills during their pre-school years should their problems be that of a pure hearing loss and not combined with any other disabilities.

3.2.3.1.2. Phonological Development in Hearing Impaired Children

Findings by Yoshinaga-Itano (2000) related to phonologic development up to pre-school are as follows:

1) Hearing impaired children who were early-identified (before 6 months) have significantly greater numbers of consonants,

consonant blends and vowels compared with children from the same hearing loss category who are later-identified.

2) Degree of hearing loss and age at identification predict speech intelligibility from 12 months through the pre-school years.
3) Children between birth and 36 months with mild to severe hearing losses have similar phonologic development when identified early. They have significantly higher phonetic repertoires than children with profound hearing loss.

3.2.3.1.3. Vocabulary skills in Hearing Impaired Children

Yoshinaga-Itano (2000) found that early identified profound, moderate and mild hearing impaired children with normal cognitive ability have expressive vocabulary lexicons similar to their normal-hearing peers. The author further found that significant development in expressive vocabulary occurs between 3 and 4 years of age in hearing impaired children.

3.2.3.1.4. Pragmatic language skills in Hearing Impaired Children

Pragmatic language skills are reported to be developed during the pre-school period for normal developing children. This implies that the children are able to make use of appropriate conversation, taking turns when talking and using polite language in appropriate situations (Santrock, 2001). Hearing impaired children may have age-appropriate vocabularies and even syntactic skills. However, many of them experience difficulties in applying their linguistic knowledge in socially appropriate situations (Northern & Downs, 2002).

Studies have suggested that positive parent-child interaction and maternal sensitivity predict language development of children who are hearing impaired (Pressman et al., 1998). It has been found that when mothers are emotionally available, their children who are hearing impaired make stronger language gains than when mothers are not emotionally available.

3.3. Developmental Assessment of Children

Generally assessment refers to the process of gathering information about an individual's abilities or knowledge and using this information to make judgements about instruction, intervention, training or rehabilitation (Schirmer, 2001). The goal of assessment thus is to evaluate an individual in terms of current and future functioning (Kaplan & Saccuzzo, 2001). By gathering and integrating information from observations, interviews, tests and records, decisions can be made regarding the appropriate services and support for a child and family.

According to Squires, Nickel and Eisert (1998), the use of formal measures in the process of assessment: firstly outweighs the limitations of pure observation; secondly it provides a structure for observation; and thirdly it increases the identification of children with mild problems who would otherwise go unidentified. A structured approach to evaluation is a valuable aid in the early identification of children in need of assistance with a view to implementing the necessary intervention.

The need for developmental assessment of infants and young children is crucial in the early identification of any possible disabilities. Information gained from assessments, serves not only as a tool for the correct diagnosis of the disability, but also assists in the construction of appropriate intervention programmes (Alridge-Smith, Bidder, Gardner & Gray, 1980; Griffiths, 1984). Most professionals feel strongly that early identification, and early implementation of intervention enhances the child's social, communicative and academic development (Calderon, 1999). The sooner a child's difficulties can be identified, the sooner can an intervention be implemented and thus the sooner the child can be assisted. According to Calderon (1999) children with special needs are at a higher risk for outcomes far below their potential. This implies that developmental problems, which are first evident in infancy or early childhood, interfere with the future development of the child and may cause a lifetime of lowered untapped potential. By leaving children with special needs and developmental delays unattended, the original disabilities may become more severe and secondary disabilities such as emotional, social and serious cognitive problems may appear (Lister, 1981).

Holt (1979) has comprehensively summarised the necessity for assessment in childhood as follows: "Any child who is suspected of having a congenital defect to deformity, a medical disorder, an impediment to educational progress or social activities or any deficiency of opportunities, is a potentially handicapped child and should be assessed" (p. 151).

Holt adds that:

> "Handicap is not a medical, educational or social problem to be treated, trained or counselled, but it is a burden which is impeding a child's development. Our task is to ease this burden and so promote the development of the person. Comprehensive assessment is the cornerstone of this work" (p.161).

Brooks-Gunn (1990) stresses that to measure the well-being of a child is to measure his physical, cognitive, social and emotional development. Thus a comprehensive developmental assessment should include these four areas of functioning, which are not mutually exclusive. A problem in one area may have an effect on another area. For example, a child who has been deprived of social and emotional stimulation may as a result, present with delayed language development. However, with early and intensive stimulation, the cognitive deficit may disappear or at least improve after a period of time.

The use of official assessment in exploring child development cannot be neglected. Meisels (1996) stated that the data of developmental assessment can be used in various ways such as: (a) identifying infants who may be at risk for developmental problems (screening); (b) verifying the presence and severity of the potential problem (diagnosis); (c) planning an appropriate environment, curriculum activities or other strategies to facilitate development (programme planning); and (d) testing theories and hypotheses about various aspects of infant development (research).

For the purpose of this study, developmental assessment will be described as a comprehensive psychological investigation of a child's abilities, including motor, social and cognitive (including language, memory, reasoning and problem-solving) abilities, using direct observation, testing, medical reports and biographical information. The clarification of children's' relative abilities and disabilities increases understanding of their behaviour and functioning in home, school and social situations and allows for appropriate provisions to be made for the children's' specific needs (Luiz, 1988a).

When using psychological tests during developmental assessments, it is imperative to ensure that the measure used to make decisions and interpretations is comprehensive, reliable and valid, as an invalid or unreliable measure will add no additional information regarding developmental milestones (Kotras, 2002). It should be noted that norms become outdated and it is therefore essential to ensure that the norms which are used are valid for contemporary society (Barnard, 2000).

A consistent finding in various studies has been that an individual's cultural group has an influence on test performance (Allan, 1988, 1992; Heimes, 1983; Mothuloe, 1990; Tukulu, 1996). Today it is generally accepted that there is no such thing as a 'culture-free' test or task, since psychological tests are samples of behaviour and behaviour is affected by the cultural milieu in which the individual is reared (Jansen, 1991). Cultural influence is thus reflected in test performance and a more realistic approach is to develop 'culture-fair' tests in which the content of the test is based on experiences that are common to different cultures.

South Africa consists of various cultural groups and by virtue of the country's past political history, the socio-cultural and educational system for each group has been developed independently from each other leading to cultural and educational discrepancies between the various population groups (Kotras, 1998). The utilization of instruments which have neither been developed nor standardized in a particular culture, can prove to be biased and thus have long term implications for the individual involved (Kotras, 1998).

Since the construction of a single test for a particular culture is fraught with many difficulties, it seems most appropriate to take an existing, widely used culture-fair test and adapt it for use in all population groups of South Africa and this is where the Griffiths Scales play a critical role. Although the Scales were developed and standardized for British children, possible cultural influences are, to some extent, neutralized by the fact that the test was developed by observing children in their natural environments while walking, talking and playing and these activities are common to most, if not all, cultures. In addition, the instrument is used and researched extensively world-wide (Allan, 1992). Important from a South African perspective is the fact that it is used in Third World Societies such as Columbia (Cobos et al., 1971). In addition, the guidelines for administering the test are not rigid, allowing the tester to demonstrate a number of items. The test should consequently be more suitable for children from different cultural groups than tests with rigid instructions such as the JSAIS which was developed for English and Afrikaans, White South African children between the ages of 3 and 7 years.

Not only is it important that the Griffiths Scales be used successfully on the various South African population groups but measures also need to be developed to assess children with varying disabilities. Children with clinical diagnosis also need to be assessed on a ‘culturally-neutral’ and contemporaneous assessment instrument that is suitable for all the children of South Africa. There is a paucity of assessment measures that can be used successfully with different cultures in South Africa and as a result of research done across cultures, the Griffiths Scales are one of the few measures that can be used with confidence. The present study thus aimed to identify whether the Revised Griffiths Scales can be used successfully on hearing impaired children across the different cultures.

3.4. Assessment Instruments

In the 1980s, the need for accurate measures for use with pre-school children was recognised and several new measures were constructed. For example, the Junior South African Individual Scales (JSAIS), the

Stanford- Binet Intelligence Test, the Bayley Scales of Infant Development – II, to mention a few, were constructed. Despite concerted efforts to address the need for more reliable and valid assessment of pre-school South African children, Allan (1992) found many shortcomings in assessment measures used with children. According to Knoesen (2003) the shortcomings listed below, are still evident today:

- The existing developmental assessment measures are not comprehensive with most measures focusing on specific aspects of development or merely being screening in nature;
- Specific tests are standardised for specific ethnic groups to the exclusion of others and there are only a limited number of standardised tests available to assess the development of Black pre-school children;
- Specific tests are standardised for specific age groups to the exclusion of others (p.71).

The following section will provide an overview of the psychological measures used in South Africa for young children. An urgent need exists to find an assessment measure that is able to accurately identify the strengths and weaknesses in young children so as to predict future scholastic performance (Knoesen, 2003).

3.4.1. Stanford- Binet Intelligence Test (Stanford-Binet Scale)

The Stanford- Binet Intelligence Scale is a standardised measure that assesses intelligence and cognitive abilities in children and adults between the ages of 2 and 23 years (Thorndike, Hagan & Sattler, 1986). The first Binet-Simon Scale was created in 1905 by psychologist Alfred Binet and Dr Theophilus Simon. The fourth edition, released in 1986, was designed with a larger, more diverse, representative sample to minimize the gender and racial inequalities that had been criticised in earlier versions of the test.

The Stanford-Binet Scale tests intelligence across four areas: (i) verbal reasoning; (ii) quantitative reasoning; (iii) abstract/visual reasoning; and (iv) short-term memory. Simeonnson (1986) saw the wide age range which the test covered as its major asset, but was critical of the measure's highly verbal nature. The verbal loading restricts its usefulness with individuals who have verbal deficits. Furthermore, no profile of strengths and weaknesses can be obtained because the test only provides a general intelligence quotient.

3.4.2. The Bayley Scales of Infant Development – II (BSID-II)

The BSID-II were published in 1969 and a revised and restandardised version was completed in 1993 (Bayley, 1969, 1993). The BSID-II measures mental and physical development, as well as emotional and social development. The revised scales are applicable for children between the ages of 1 and 42 months. The instrument comprises of three scales, namely, the Mental, Motor and Behaviour Scales. The Mental Scale yields a normalised standard score and is intended to assess sensory-perceptual acuities and discrimination, object constancy, memory, learning, problem-solving, early verbal communication, early abstract thinking, and early number concept. The Motor Scale yields a standard score and evaluates gross motor and fine motor skills. The Behavioural Scale provides a qualitative assessment of attention, orientation, emotional regulation, and motor quality.

The BSID-II was designed to gain information about a wide variety of developmental abilities and achievement of developmental milestones. Anastasi (1982) considered the test construction procedures to be of a very high technical standard, with an average reliability coefficient of 0.88 being reported. It is, however, suggested that more concurrent and construct validity studies be conducted on the revised Scales. Further studies are also recommended to investigate the Scales' suitability with special populations (Barnard, 2000).

3.4.3. The Gesell Developmental Schedules (Gesell Schedules)

The Gesell Schedules were developed in 1940 and assess children between the ages of 1 month to 6 years on four main areas of development, namely: motor development, including postural reaction, balance, sitting and locomotion; language development, including facial expressions, gestures and vocalisations; adaptive behaviour, including alertness, intelligence and various forms of constructive exploration, and; personal-social behaviour, including feeding, dressing, toilet training and play behaviour. Age placements are determined by the percentage of children who pass each item. Although the Gesell Schedules are considered less standardised and more subjective than many other psychological tests, they have still been used as a main source of data for many infant and pre-school tests (Brooks & Weinraub, 1976).

3.4.4. The Cattell Infant Intelligence Scales (The Cattell Scales)

The Cattell Scales were developed by adapting the already existing Gesell Schedules. The Cattell Scales measure mental development from 3 to 30 months, evaluating motor control and verbalisations. Motor control is assessed by a series of tasks that involve manipulating various objects, such as cubes, pencils and pegboards. During the motor control subtests, the examiner takes notes on the infant's attempts to communicate. Literature reveals conflicting findings regarding the reliability and validity of the Cattell Scales (Brooks & Weinraub, 1976).

3.4.5. Wechsler Intelligence Scale for Children (WISC)

The Wechsler Intelligence Scale for Children was developed in 1949 and it was replaced by a standardised version known as the Wechsler Intelligence Scale for Children-Revised (WISC-R) in 1974. The WISC evaluates the cognitive and intellectual abilities in children between the ages of 5 and 15 years. Despite the technical superiority of the WISC-R, studies investigating its reliability and validity have found to be insufficient and inconclusive (Anastasi, 1982). More recently, the WISC-R has undergone another revision and has been replaced with the WISC-III. The purpose of the revision was to improve the contemporaneous nature of the norms and to update its content coverage.

3.4.6. Wechsler Pre-school and Primary Scale of Intelligence Revised (WPPSI-R)

The WPPSI-R was developed in 1989 as an extension of the WISC. It was designed especially for children between the ages of 4 years to 6 years 7 months. The test battery consists of 12 subtests which are grouped into a verbal and performance scale. The WWPSI-R has been found to be easy to administer, having a simple administration procedure. The major criticism, however, is its inability to estimate the IQ of severely retarded children and ethnic minority children from low socio-economic backgrounds (Groth-Marant, 1984).

3.4.7. McCarthy Scales of Children's Abilities (McCarthy Scales)

The McCarthy Scales were published in 1972 to assess the cognitive development and motor skills of children aged 2 years 6 months to 8 years 6 months. The tests consist of 18 tests grouped into six subscales, namely: verbal, perceptual-performance, quantitative, general cognitive, memory and motor. The General Cognitive Index (GCI), based on 15 of the 18 subtests, indicates the child's level of functioning at the time of testing with no implications of immutability or aetiology. Anastasi (1982) regards the McCarthy Scales as being a well-constructed instrument and yielding psychometrically sound results. However, Nuttall, Romero and Kalesnik (1992) caution its use with children who are mentally retarded, gifted, or below the age of 5 years due to the McCarthy Scales inadequate floor and low ceiling levels. The McCarthy Scales have been adapted for use in South Africa and some normative information is available for various groups of children (Foxcroft & Roodt, 2001).

3.4.8. Non-verbal measures

A number of non-verbal measures have gained prominence due to their culture-fair attributes and are widely used today. These include the Test of Nonverbal Intelligence (TONI), (Brown, Sherbenou & Dollar, 1982); the Vineland Social Maturity Scales (Vineland), (Doll, 1965); the Goodenough-Harris Draw-a-Person Test (DAP), (Harris, 1963); Raven's Progressive

Matrices (RPM), (Raven, 1947b); and Kaufman Assessment Battery for Children (K-ABC), (Kaufmann & Kaufmann, 1983).

The DAP requires drawing of people, while the TONI, Raven and K-ABC are figural reasoning measures. The above-mentioned non-verbal measures do not include all areas of development and all age groups. The TONI and the Raven cannot be used for children younger than 5 and 6 years of age respectively. The DAP and the K-ABC are not suitable for children under 3 years and 2 years 6 months respectively. Although the Vineland includes items for the first 3 years of life, it does not cover all important areas of development, since it is only a measure of social competence. Furthermore, the Vineland relies solely on the caregiver's responses. Although the tests are relatively culture fair, they have not proved better for predictive purposes than the usual verbal tests with minority groups in the United States or elsewhere (Sundberg & Gonzalies, 1981).

3.4.9. The Junior South African Individual Scales (JSAIS)

The JSAIS was developed in 1979 for White South African children between the ages of 3 and 7 years 11 months (Madge, 1981). It was developed at a time where separate measures were developed and used for the different population groups in South Africa. The main aim of the battery is two-fold, namely, to establish the general intellectual level of children between the ages of 3 years 0 months and just under 8 years, and to evaluate a child's relatively strong and weak areas of functioning (Madge, 1981). The complete test consists of 22 subtests. Twelve of these subtests constitute the General Intelligence Quotient (GIQ) and are grouped into four subscales, namely the Verbal Intelligence Scale (VIQ), the Performance Intelligence Scale (PIQ), the Numerical Scale and the Memory Scale. The usefulness of these scales is ascribed to the assessment of a wide spectrum of abilities from which the child's general intellectual level is obtained.

Swart (1987) adapted and standardised the JSAIS for Asian children. In addition, norms specifically for Coloured children between the ages of 6 years to 8 years 11 months were also published (Robinson, 1989). Van der

Berg (1987), however, argued that Black children can only be included in the norm population once parallel forms of the test have been developed for South African Black languages. Therefore, it is evident that the major limitation of the use of the JSAIS is its lack of norms for the diverse South African population. The test is also language loaded and therefore not a true reflection of the cognitive abilities of hearing impaired children (Bradley-Johnson & Evans, 1991).

3.4.10. The Herbst Measure

In 1994 Herbst constructed the Herbst assessment measure which was designed to provide a measure specifically suited to the developmental assessment of Black children in South Africa. The Herbst measure consists of a battery of items to determine the many aspects of development, namely, Cognitive Aspects (including visual perceptual abilities), Fine Motor Development and Gross Motor Development in 3 to 6 year old Black children. It provides the practitioner with a quantitative depiction of the child's ability as well as possible neurological indicators. Limited information regarding the procedures employed to norm the measure is available. A normative sample of 249 Black children was used. Normative data, including percentiles, are provided for each subtest of the Herbst measure.

3.4.11. The Griffiths Scales of Mental Development (GSMD)

The Griffiths Scales were compiled for infants from birth to 2 years of age. There were five scales measuring locomotor development, personal-social adjustment, hearing and speech, hand and eye co-ordination and performance. In 1970 the Griffiths Extended Scales were published to cater for children between the ages of 3 and 8 years (Griffiths, 1970;1984). The Extended Scales included a sixth scale which measures practical reasoning abilities. Allan's (1992) study presented the Griffiths Scales as being a valid and reliable assessment tool for pre-school children, which is significant for the present study.

The Griffiths Scales are currently being revised to make the items more contemporary. The focus of this study is on the Revised Extended Griffiths Scales, and it will therefore be discussed in more depth in Chapter 3.

3.5. Assessment of Hearing Impaired Children

Ideally the assessment process of hearing impaired children consists of the following five steps: (a) identification; (b) screening; (c) in-depth assessment; (d) intervention; and (e) evaluation (Bondurant-Utz & Luciano, 1994). As hearing impairment is relatively invisible, hearing screening tests have been used for the past 60 years to identify children for further auditory evaluation (Northern & Downs, 2002). In the past, South Africa has made use of the Manchester mid-frequency rattle test to identify possible hearing loss. To use the rattle test properly, two trained health professionals and the parent have to be present, a rattle is needed, along with a reasonably quiet environment. The test involves shaking the rattle behind the child's head to see if it reacts. Because South Africa’s primary health care staff is overwhelmed and two health professionals are seldom available to test one child, a switch is being made to using a general questionnaire, relating to deafness in the family and whether the child reacts to sound (Caelers, 2002).

Funding and human resources seems to be the major obstacle in health care provision in our country. South Africa cannot afford the cost of auto acoustic emission devices which are currently used in the United States and other First World countries (Caelers, 2002). In addition, only an audiologist can conduct this type of screening, and South Africa has insufficient qualified audiologists to implement this screening programme. Another major concern in South Africa is that presently there are a limited number of school nurses and hearing and speech specialists available in the public sector to assess hearing and implement language screening. A successful hearing screening at birth may give the false impression that no further follow-up is required, although some children may be at risk of a delayed-onset hearing loss. Unless the hearing loss is profound, the loss may only be identified in the pre-school years, which implies that the language and communication skills required for formal learning are poorly developed (Mann, Cuttler & Campbell, 2001).

South Africa's support centres with multi-disciplinary staff are diminishing and currently only a few developmental clinics are attached to universities and academic hospitals to assist with screening of hearing. Private intervention is costly and due to the shortage of services and cost of measuring devices, these private services are usually only available in urban areas. It is therefore important for both parents and teachers to request follow-up testing should they suspect hearing problems.

According to Bradley-Johnson and Evans (1991) the primary purposes for assessing hearing impaired children are: (a) to diagnose their problems; (b) to identify instructional needs; (c) to document progress in special programmes; and (d) to provide information for research. The present research fulfils all these purposes in one or other way. The children's strengths and weaknesses will be identified, thereby highlighting possible instructional needs, as well as progress made while attending the Carel du Toit Pre-School. Valuable information will be provided in terms of research on hearing impaired pre-school children in South Africa by being the first research to use the Revised Extended Griffiths Scales on this clinical population.

Selecting tests to assess hearing impaired children is no easy task. Whether to use norms for normally hearing children or hearing impaired children is a question for which there is no simple answer. In making this decision, the researcher must consider the purpose for testing and the background of the child. Bradley-Johnson and Evans (1991) propose that if the purpose is to compare the child's current level of performance with that of normally hearing children and the child is able to understand the instructions and make the required responses, then norms for normally hearing children may be considered. In using these norms, however, one assumes that acculturation of the child has been similar to that of hearing children in the norm sample, which may not be the case.

Braden (1994) reviewed the published literature on the intellectual assessment of the hearing impaired population and found support for the following conclusions:

- Recommended practice is the use of non-verbal tests, or performance tests. Verbal tests yield lower IQ scores than non-verbal tests and should therefore not be used with hearing impaired individuals.
- Assessment measures should be administered by psychologists who are proficient in the language system used by the hearing impaired individual.
- The question of using deviation IQ's based on normative samples from the hearing impaired population is still open, but research tends to support arguments against the use of special norms. In other words, comparing hearing impaired individuals exclusively to the performance of other hearing impaired individuals is not considered best practice.

Taking the above findings into consideration, it seemed appropriate to assess the hearing impaired children on the Revised Extended Griffiths Scales. The informal manner in which the assessment measure is administered allows for use on a clinical population. Pantomime may be used to assist a hearing impaired child in understanding the instructions. As research has recommended, the children's performance will be compared to that of a normal sample. To overcome problems associated with interpreting hearing impaired children's' results on tests standardised on hearing children, the present study took into account the information obtained from school records, classroom observations and reports from the various therapists and teachers to substantiate the quantitative data collected. Enough information was collated to implement a therapeutic intervention.

Assessment with hearing impaired individuals is fraught with all of the problems associated with testing in general, along with the confounding factors of language proficiency, communication compatibilities between the tester and testee, and culturally relevant experiential differences between the hearing impaired person and the population on which the test was normed. Accommodations, such as modifications of tests and adaptations to the delivery of instructions, may only serve to invalidate results (Schirmer, 2001). The development of tests or norms specifically for hearing impaired individuals may only serve to isolate these individuals from the opportunities within the broader educational and vocational settings because of the assumptions about capability on which they are based. Just as one communication method, such as total communication, cannot be recommended for all hearing impaired children, no one set of tests can be deemed appropriate for use with all hearing impaired children. Instead, flexibility is required to tailor assessment to a particular child's needs.

A limited number of the assessment measures mentioned above are valid for the hearing impaired population. Use of the BSID Mental Scale with hearing impaired infants and pre-schoolers is, for example, restricted because a large number of items require hearing, speech or language skills (Bradley-Johnson & Evans, 1991). The usefulness of the Stanford Binet Scale with hearing impaired children is yet to be determined. Currently, the test lacks instructions standardised on a representative sample of hearing impaired children and lacks demonstrated validity and reliability with this population (Bradley-Johnson & Evans, 1991). Although the WISC-R was adapted for the hearing impaired population and contains modified WISC-R Performance Scale instructions standardised on hearing impaired children, the test does not possess adequate standardisation or demonstrated reliability and validity, and support for its use is thus not strong (Bradley-Johnson & Evans, 1991). In view of the above mentioned findings, it is essential that the scores of these assessment measures are only used in a supplementary manner for hearing impaired children.

According to Bradley-Johnson and Evans (1991), the following psychological tests have been adapted for use with hearing impaired children.

3.5.1. Hiskey-Nebraska Test of Learning Aptitude

The Hiskey-Nebraska Test of Learning Aptitude is a general intelligence test with separate norms for hearing and hearing impaired children aged 3 to 16 years. Instructions for hearing impaired children are pantomimed and all subtests require non-vocal responses. The test is composed of 12 subtests. The first five subtests are for ages 3 to 10, the next 3 are for all ages and the final 4 are for ages 11 to 16. Many of the subtests require visual memory skills. Levine's (in Bradley-Johnson & Evans, 1991) survey found the Hiskey-Nebraska to be the sixth most popular assessment instrument with hearing impaired children. The limitations of the test include the following: (a) the scores appear to be too high; (b) the norms lack representativeness; and (c) the administration takes long with some students.

3.5.2. Smith-Johnson Non-verbal Performance Scale

The Smith-Johnson Performance Scale was developed for hearing and hearing impaired pre-school children from 2 to 4 years of age. The purpose of the scale is to interpret tasks already established as measures of cognitive ability. The test consists of 65 items which are administered through pantomime. Separate norms are provided for hearing and hearing impaired children, allowing comparisons between the two groups. The scale has been useful, especially with children who have a mild to moderate hearing loss.

3.5.3. An Adaptation of the Wechsler Pre-School and Primary Scale of Intelligence for Deaf Children

The Adaptation of the Wechsler Pre-School and Primary Scale of Intelligence for Deaf Children is designed as a standardisation of the WPPSI Performance Scale for hearing impaired children. The Adaptation uses the same Performance Scale items and materials as the WPPSI, but modifies WPPSI instructions to better convey subtest instructions to hearing impaired children. The Adaptation Supplemental Instructions add two sample items to the Animal House subtest, five sample items to the Picture Completion subtest, three sample items to the Maze subtest and three sample items to the Block Design subtest.

The Adaptation has the potential to be a valuable tool for evaluating the cognitive skills of hearing impaired children, but the standardisation sample is too limited in number of demographic characteristics to represent adequately a national population (Bradley-Johnson & Evans, 1991).

3.5.4. Central Institute for the Deaf Pre-School Performance Scale

The Central Institute for the Deaf Pre-School Performance Scale is a measure of intelligence for children between the age of 2 years and 5 years 5 months. Both the test instructions and the child's responses are non-verbal. Because each subtest has only a few items, interpretation of performance on the subtests is highly questionable, although the overall score could provide some useful information if interpreted cautiously (Bradley-Johnson & Evans, 1991).

It is evident that there is an absence of psychological tests specifically designed for the assessment of hearing impaired children. It is thus vital that a comprehensive and accurate assessment measure is identified for this clinical population.

3.6. Chapter Overview

Hearing and hearing impaired children head down somewhat different developmental paths. Early identification and intervention seems crucial in assisting the hearing impaired children to develop to their full potential. With stimulation, continuous evaluation, educational and therapeutic support, the hearing impaired children are provided with optimal opportunities needed to overcome the many challenges that they may need to face.

Having discussed the importance of developmental assessment for early identification of possible deficits, the Griffiths Scales will be discussed in more detail in Chapter 4.

CHAPTER FOUR: GRIFFITHS SCALES OF MENTAL DEVELOPMENT

4.1. Introduction

This chapter will provide an overview of the development and content of the original Griffiths Scales of Mental Development (Griffiths Scales), research completed on the Scales and the reasoning behind the need to revise the Scales. Towards the end of the chapter, emphasis will be placed on the Revised Extended Griffiths Scales, as this is the measuring instrument employed in the present study.

4.2. Development and Content of the Original Griffiths Scales

The concept of ‘developmental assessment’ is synonymous with the name Ruth Griffiths (Allan, 1992) and to date, Griffiths is one of the pioneers of the psychology of early child development in the United Kingdom. By constructing the Griffiths Scales, Griffiths creatively linked the traditional normative and clinical methods of child assessment, by combining them into a set of comprehensive Scales.

The Griffiths Scales were originally developed by Ruth Griffiths in the United Kingdom in 1954 to assess the development of children from birth to 2 years of age (Griffiths, 1954; 1970; 1986). The Griffiths Infant Scales were and still are regarded as being one of the most carefully constructed infant scales and one of the best-known tests developed in England (Thomas, 1970). The major impetus for the development of the Scales was a need for the early diagnosis of developmental backlogs in children. Initially the Scales were devised by drawing substantially upon previously published scales, in particular the Gesell Developmental Schedules. Since previously published infant scales such as the Stanford Binet Intelligence Test and Wechsler Intelligence Scale for Children lacked speech items, Griffiths included twice as many speech items in her Scale. She believed that speech is a “unique human intellectual task” (Brooks & Weinraub, 1976, p.46) and should therefore be included in any infant assessment scale. Griffiths also added items of a social nature, especially for the first year of development.

The Griffiths Infant Scales consisted of five subscales, namely, the Locomotor (Subscale A), Personal-Social (Subscale B), Hearing and Speech (Subscale C), Eye and Hand Co-ordination (Subscale D), and Performance (Subscale E) Subscales. Griffiths received many requests for the extension of the Infant Scales for use in clinical practice with older children. To meet this need, the Scales were revised and extended in 1970 to cover ages from birth to 8 years 4 months (Griffiths, 1970). Griffiths later realized that certain skills and items of learning could not be logically fitted into any of the five subscales. As a result, a sixth subscale, namely the Practical Reasoning Subscale (Subscale F) was added to the test for children aged 2 years and older. This subscale was to provide a more comprehensive coverage of the young children's emerging problem-solving and logical reasoning skills (Griffiths, 1970). Constructing the extra subscale resulted in the development of the Griffiths Extended Scales.

Griffiths (1970, 1984) adhered to the following five stringent criteria when developing the Griffiths Scales:

1. The development of the Scales was based on detailed systematic observation of children in the United Kingdom. Children were observed in their natural environments – at home, at play, in the streets, on trains and buses and in school playgrounds – and their behaviour was recorded. From these formal and incidental observations, material for the test items emerged.
2. Previous and existing test methods and tests such as the Gesell Developmental Scales were taken into account and items from relevant tests were included in the Griffiths Scales (Buhler, 1935; Gesell, 1925; Shirley, 1933).
3. The Scales had to fulfil stringent statistical requirements in terms of its reliability and validity.

4. The Scales took into account the special needs of both disabled and normal children.
5. The Scales were based on a study of: (i) trends that appeared significant for mental growth, and (ii) the origins and interrelations among the “basic avenues of learning”, namely, physiological or locomotor, eye and hand, voice and hearing, which development takes place with rhythm, in time and space and is influenced by environmental factors and social factors (Griffiths, 1984, p. 5).

While the majority of developmental tests for children mostly focus on the cognitive development of the child, the Griffiths Scales provide a comprehensive developmental profile, which highlights areas of development such as locomotor and personal-social development in addition to the child’s cognitive and perceptual skills. The items on the scales are diverse (Brooks-Gunn, 1990) and tap the main aspects of a child’s development, namely, the physical, cognitive, social and emotional. It is a norm-referenced test and the items of each subscale are arranged in order of gradually increasing difficulty (Griffiths, 1984). Many of the items are based on natural activities such as walking, talking and playing.

Play is considered to be a universal activity and research findings indicate that different types of play emerge at about the same age in children from different cultures (Kagan, 1981). Constructing the Griffiths Scales according to such a universal activity implies that the Scales can be regarded as being potentially ‘culture-fair’. In addition, the Scales have been researched worldwide since the 1970’s and have been adapted for use in several countries, further suggesting that they are relatively culture fair. Such factors are relevant to the current study, as the sample comprises children of various cultural groups within the South African context.

Griffiths (1970) stated that each of the six subscales of the Griffiths Scales were devised to be a separate and complete scale in itself. This allows any one process of development to be measured independently and as completely as possible. The six subscales are equal in difficulty at each age level and comprise the General Quotient (GQ). A child's performance on the different subscales is plotted on a histogram, allowing his/her performance to be compared to the norm. The developmental profile demonstrates the individual child's range of abilities and relative disabilities and allows for a comparison of these at different times. The resulting mental age is compared against the child's chronological age to identify possible strengths and/or weaknesses. A brief description of the subscales follows below.

- **Locomotor Subscale (A)**

This subscale provides the opportunity to observe certain physical weaknesses, physical disabilities, neurological deficits or more definite inadequacies of movement. Items include walking up and down stairs, hopping, throwing and kicking a ball, jumping over a rope, to name but a few. The items challenge the child's regular physical strength, skill in speed and movement, rhythm and poise at a level compatible with his/her age. The child's ability to focus and concentrate on the task at hand and the emotional determination to succeed further influence performance.

- **Personal-Social Subscale (B)**

This subscale assesses personal and social development. At a level which corresponds with the child's age, a degree of self-help is required from the child in terms of his/her independence. Activities include personal cleanliness, efficiency at the table, the ability to wash his/her hands and face, to dress and undress, to fasten buttons and the like. Information such as the child's name, home address, family name, and so on, can be gleaned through a casual conversation with the child. Some degree of social interaction is necessary from the child, as is co-operation in play with other children. Although emotional factors affect performance on all subscales, they usually have a more explicit influence on this subscale. Griffiths (1984) stated that the over-protected child and the neglected child usually do rather poorly on this subscale.

- **Hearing and Speech Subscale (C)**

This subscale is the most intellectual of all the subscales and assesses the growth and development of both receptive and expressive language. The subscale not only necessitates the comprehension of language, but also specific verbal expressive skills in terms of vocabulary, the use of different parts of speech, the use of sentences and paragraphs and the use of auditory memory. Items include the naming of colours, the naming of similarities and opposites, the repetition of sentences with a varying number of syllables, the identification of stimuli picture cards and so on. Regarding older children, the gradual enhancement of expressive vocabulary, the use of different parts of speech, learning to use sentences and to develop paragraphs of description in relation to pictures is assessed. Children who perform poorly on this subscale, relative to their own performance on the other subscales, may have speech and/or language deficits or may possibly be suffering from a hearing loss.

- **Eye and Hand Co-ordination Subscale (D)**

This subscale is comprised of items relating to handwork and visual ability. The child is required to demonstrate manual dexterity, hand-eye co-ordination, manipulation and control of a pencil and persistence with a task. Items inter alia include the threading of breads, drawing, cutting of paper and writing. From the child's drawings, it is possible to obtain information on his/her personality, as well as on his/her conception of special relationships.

- **Performance Subscale (E)**

This subscale assesses skills in manipulation, speed and precision of activities requiring manual manipulation within time limits. Spatial perception and visual activity are required for the completion of the tasks on this subscale. Items correspond with those on the Hand and Eye Co-ordination Subscale, as a certain degree of manual performance is required of the child. Items on this subscale include, building stairs and bridges with blocks, the use of a form-board and pattern making. This subscale supplements Subscale D in that in Subscale E, manual dexterity and eye-hand co-ordination are assumed and the child is required to apply these skills in novel situations.

- **Practical Reasoning Subscale (F)**

This subscale is only introduced to children over the age of 2 years and focuses mainly on assessing the most primitive indications of arithmetical comprehension, and the realization of the most basic practical problems. It has value in demonstrating a child's ability to benefit from formal schooling. Attention and concentration span also plays a role on this subscale, as with all the other subscales. Items include the repetition of digits, which gives an indication of short-term auditory memory, as well as differentiation of objects in terms of size, weight, length and height.

4.3. The Standardisation of the Original Griffiths Scales

The Griffiths Scales were standardized by drawing on British samples for the development and extension of the Scales (Griffiths, 1960). The samples, which were chosen to be as representative of the total British community as possible, consisted of 2260 children from the first to the eighth year of life and comprised the following:

1. approximately equal number of girls and boys;
2. children from congested urban areas as well as secluded country and coastal areas and from diverse geographical areas of the country (England, Wales and Scotland);
3. children from different institutions, for example schools, play centres and child guidance clinics;
4. children in each age group of the sample which corresponded significantly to the most recent available population consensus (1960) regarding paternal occupation.

In the standardising and equalising of the original Scales (1960), the number and percentage of children passing each item were calculated for each two-months age group, commencing with the first two months of the first year, and continuing to the 96th month. In the final version of the Griffiths Scales, each item was placed as close as possible to the point where it was passed by 50% of the children in a two-month age group (Stewart, 1997). The progressive deterioration in the percentage of children passing the successive items in every scale, demonstrated that items in every subscale are arranged in order of increasing difficulty (Griffiths, 1960).

The Griffiths Scales were introduced to South Africa in 1977 and to date there are approximately 400 registered South African users. The Griffiths Scales have been translated using the Brislin's (1970) back-translation technique, into Afrikaans (Allan, 1988) and Xhosa (Tukulu, 1996) and have been administered on different South African cultural groups (Allan, 1992; Bhamjee 1991; Kotras, 2002; Mothuloe, 1990).

4.4. The Administration and Scoring of the Griffiths Scales

The Griffiths Extended Scales consist of 468 items. There are two items per month in each of the five relevant subscales from 0 to 24 months, thus allowing a half-month credit for each item. From the third to eighth year there are six items for each year in each subscale, plus two extra items for the ninth year in each subscale, thus allowing two months credit for each item in each subscale.

The tester begins to administer the items approximately four months below the child's chronological age. A basal of six constructive passes is required on each subscale before the tester can continue with the administration of the rest of the items on that subscale. If a child fails any of the first six items in a subscale, earlier items are administered until a basal of six consecutive passes is achieved. The items on each subscale should be administered until the child fails six consecutive items on the subscale. This then represents the ceiling level as well as the maximum level of development of the child as measured by that subscale. The sum of the credits for all the items below the basal of six consecutive passes and for all the items passed over the basal, provides a separate mental age (M.A.) for every subscale. Developmental quotients are calculated for each subscale by means of the following formula:

$$QX = \frac{M.A. \times 100}{C.A.}$$

where C.A. refers to the child's chronological age in months and X represents the subscale for which the developmental quotient is being evaluated (Griffiths, 1984). Table 4 illustrates how Griffiths (1984) named the developmental quotients of the subscales.

Table 4: An illustration of the developmental quotients of the Griffiths Scales

QA = Locomotor Quotient QB = Personal-Social Quotient QC = Verbal Quotient (Hearing and Speech Scale) QD = Eye and Hand Quotient QE = Performance Quotient QF = Practical Quotient (known as Practical Reasoning) GQ = General Intelligence Quotient, which is derived by taking the average of the child's performance on each of the six subscale quotients.

For a quick overall assessment, the total number of items passed is divided by three for items in year three to eight. This is done because the test consists of 36 items for each year of life from year three. The total credit for the whole range is calculated by adding the M.A. credit for the first two years of life to the M.A. credit the child achieved in the rest of the subscales. The general formula used to calculate the developmental quotients for each subscale, is then used to calculate the G.Q. As each subscale has been standardized separately, each can be used and scored individually. Using quotients instead of mental ages makes it feasible to compare children of different chronological ages and also to compare a child's performance at different times.

4.5. The Interpretation of Performance on the Griffiths Scales

By studying the profiles of a large number of children, Griffiths (1984) identified certain patterns of performance on the subscales that aided in the interpretation of an individual child's performance. Diagnostic interpretations are also possible since the Griffiths Scales are a diagnostic tool.

Overly protected or socio-environmentally deprived children usually do not perform at an age-appropriate level on the Personal-Social Subscale. This may be as a result of their lack of exposure to learning self-help activities and ensuring their own personal care. Children with a poor performance on the Locomotor and Eye and Hand Co-ordination Subscales have shown to possibly suffer from a physical defect, some degree of muscular weakness or visual perceptual problems. A low score on the Hearing and Speech Subscale can be attributed to a hearing or language impairment, or a lack of environmental stimulation. This low score is often accompanied by poor performance on the Practical Reasoning Subscale and Personal-Social Subscale. This pattern of development was confirmed in a longitudinal case study conducted by Luiz (1988a) on a child with a hearing loss. The drawings in the Eye and Hand Co-ordination Subscale can provide valuable information on the child's personality. Bhamjee (1991), in her study on South African Indian children, stated that unusually small or constricted drawings are indicative of possible depressed mood, while very rapid or very slow execution of drawings could suggest anxiety. Rapid drawing could also be the result of poor hand-eye co-ordination, poor concentration or a lack of stimulation.

Consistently low performance on each subscale is usually indicative of general developmental delay, with the level of performance indicating the degree of delay. The resulting developmental profile of the child on the Griffiths Scales provides useful information that can be used for:

1. the identification of abilities and difficulties;
2. decisions for further investigations such as speech therapy, occupational therapy or specialized education;
3. the construction of treatment programmes to address skill deficits;
4. evaluating the effect of treatment; and
5. decisions about placement that will allow the child to develop to his/her fullest potential (Griffiths, 1970, 1984; Hall, 1971a; Hanson, 1982; Lister, 1981).

4.6. Research Studies on the Original Griffiths Scales

The clinical merit of the Griffiths Scales is ever increasing. Research on the Scales have been generated from as far a field as Canada (Ramsay & Fitzharding, 1977), Columbia (Cobos, Rodriques & De Venegas, 1971), France (Laroche, Brabant & Brabant, 1976; Laroche, Gutz & Desbiolles, 1974), Germany (Brandt, 1983, 1984), China (Collins, Jupp, Maberly, Morris & Eastman, 1987), Norway (Sletten, 1970, 1977), Australia, Greece, Lebanon and United States of America. The Scales have also been successfully utilised in South Africa on a wide-range of the population.

Initially the research on the Griffiths Scales consisted of case studies (Krige, 1988; Luiz, 1988a, 1988b) and correlational studies, which investigated the relationship between the Griffiths Scales and other measures (e.g., Heimes, 1983; Lombard, 1989; Luiz, 1988c; Mothuloe, 1990; Worsfold, 1993). Such studies preceded normative studies using larger samples of Black, White, Asian and Coloured children (e.g., Allan, 1988, 1992; Bhamjee, 1991). These studies were followed by validity studies (e.g., Stewart, 1997; Luiz, Foxcroft & Stewart, 1999; Povey, 2002) and current research is focusing on the overall revision process of the Griffiths Extended Scales (e.g., Barnard, 2000; Kotras, 2003) and on clinical populations (Kotras, 2002).

The Griffiths Scales have been researched using both clinical and technical studies. Research relating to the clinical use of the Scales has provided evidence that the Griffiths Scales are useful in the clinical assessment and diagnosis of children from normal, as well as diverse special population groups. The Scales have been administered to a wide range of children, including a hearing impaired child (Luiz, 1988a), a battered child (Luiz, 1988b), borderline mentally handicapped pre-schoolers (Houston-McMillan, 1988), Black South African HIV+ infants (Kotras, 2002) and a physically disabled child (Krige, 1988). The present study will further contribute to the clinical research domain by focusing on the clinical population of hearing impaired pre-school children.

Research related to the technical properties of the Griffiths Scales shows that they comprise a reliable and valid psychological instrument (e.g., Beail, 1985; Griffiths, 1984; Luiz, 1988c; Mothuloe, 1990; Stewart, 1997; Worsfold, 1993). Furthermore, technical research has also provided information on the normal performance of children of different ages and different population groups on the Griffiths Scales.

4.6.1. Reliability Studies

Griffiths (1984) investigated the test-retest reliability of the Extended Griffiths Scales by testing a sample of children (N=270) from various regions in the United Kingdom between the ages of birth and 7 years. A test-retest reliability of 0.77 was obtained. Honzik, McFarlane and Allan (1966) found reliability coefficients ranging between 0.71 and 0.76 for a sample of 3 to 5 year old children. These studies indicated that the Griffiths Scales were a stable measure of development.

Studies investigating the inter-rater reliability of the Griffiths Scales have also been administered. Alridge-Smith et al. (1980) conducted a study whereby raters were asked to individually score a video recording of eight normal children between the ages of 6 months to 7 years 3 months. They found an acceptable overall reliability level of between 0.6 and 1.0 for 78% of the cases. Greater agreement was found between all the raters on the Eye and Hand Co-ordination (84%), Performance (91%) and Practical Reasoning Subscales (95%), as opposed to their agreement on the Locomotor, Personal-Social and Hearing and Speech Subscales. It was hypothesised that the latter three subscales may be more sensitive to individual interpretation and that the small sample size, few scorers, and scoring based on the mother's report may be responsible for the lower inter-rater reliability on the latter three subscales. When reviewing Griffiths' manuals (1954, 1970) users found the guidelines provided for scoring several of the Locomotor, Personal-Social and Hearing and Speech items to be vague and at times ambiguous. Such findings needed to be incorporated into the revision process of the Griffiths Extended Scales. It was therefore recommended that a comprehensive item analysis with a larger sample be conducted to examine which of the items were responsible for the greatest discrepancies in the ratings (Alridge-Smith et al., 1980).

4.6.2. Validity Studies

During the original standardisation research of the Griffiths Scales, the interrelationships among the individual subscales were examined. The results are reported in the table below.

Table 5: Correlations between Subscales A to F and GQ for 285 Children on their Fifths Year on the Griffiths Scales

Subscale	Quotient	r	Quotients correlated
A. Locomotor Development	101.38	.6419	A.Q. and G.Q
B. Personal-Social Development	101.04	.6537	B.Q. and G.Q
C. Hearing and Speech	99.72	.7776	C.Q. and G.Q
D. Hand and Eye Co-ordination	99.96	.7551	D.Q. and G.Q
E. Performance Tests	100.08	.7265	E.Q. and G.Q
F. Practical Reasoning	99.36	.7793	F.Q. and G.Q

(Adapted from Griffiths, 1970, p.72)

Griffiths (1970) reasoned that given the moderate correlations found, it could be reasoned that a common factor of general intelligence underlies performance on each subscale. Griffiths (1970) further recognised that the Locomotor Subscale had the lowest correlation with the GQ. She felt that it was, however, important to include this subscale as it provided a measure of an important developmental domain. The higher correlations for subscales C, D, E and F were understood by Griffiths (1970) as providing an indication of the general intelligence factor or ‘g’ as described by Spearman (1927). Griffiths (1970) hypothesised that the remaining variance could be accounted for by the specific factors or abilities which the individual subscales purported to measure.

To establish the construct validity of the original Extended Griffiths Scales, they were compared to the Termin-Merrill Scale (a revision of the Stanford-Binet). The Termin-Merrill was administered to 534 of the 2260 children used in the standardisation sample. The children were aged between

3 and 6 years. Results revealed that the General Quotient (GQ) of the Griffiths Scales ranged from 99.45 to 101.92 for the different age groups, while the Termin-Merrill Intelligence Quotient (IQ) ranged from 102.77 to 106.87. Satisfactory correlations between the GQ and IQ were calculated, varying from r = 0.79 to r = 0.81 for the different year groups.

Studies by Beail (1985), Ramsay and Fitzhardinge (1977) and Ramsay and Piper (1980) have found high positive correlations (ranging from between r = 0.73 to r = 0.98) for the Griffiths and Bayley Scales, Bayley and Cattell Infant Intelligence Scales, and between the Cattell and Griffiths Scales (Bayley, 1969; Caldwell & Drachman, 1964).

Heimes (1983) examined the relationship between the Griffiths Scales and the JSAIS. The results revealed a generally high positive correlation and it was concluded that the two tests assess the same construct (Heimes, 1983). Luiz and Heimes (1994) researched the construct validity of the Griffiths Scales on a South African sample by comparing the GQ of the Griffiths Scales with the Intelligence Quotient (IQ) of the Junior South African Intelligence Scale (JSAIS). Significant positive correlations ranging between r = 0.43 and r = 0.81 were found suggesting that the Griffiths Scales and the JSAIS tapped similar constructs. This study was, however, conducted on a White South African population and therefore cannot be generalised to other population groups.

Luiz (1988c) compared the performance of 32 White children with possible developmental delays on the Griffiths' Hearing and Speech Subscale (Subscale C) with the Reynell Verbal Comprehension Scale A. The results indicated no significant difference in age scores for each age range. A significantly high correlation of r = 0.92 was reported between the two scales.

Mothuloe (1990) administered the Griffiths Scales and the Aptitude Tests for School Beginners (ASB) to a sample of 45 Black Setswana-speaking Grade 1 children between the ages of 5 years 9 months and 7 years

3 months. Significant correlations were found between the assessment measures, ranging from $\underline{r} = 0.32$ to $\underline{r} = 0.62$.

Luiz, Folsher and Lombard (1989) correlated the performance of 64 White South African children between the ages of 5 and 6 years on the School Readiness Evaluation by Trained Teachers (SETT) with the Griffiths Scales. Correlations of $\underline{r} = 0.68$ for Afrikaans-speaking children and $\underline{r} = 0.48$ for English-speaking children were reported. It was hypothesised that the reason for the low correlations was that the Griffiths Scales are a diagnostic measure, while the SETT is a screening measure.

Luiz et al. (1999) conducted further research on the construct validity of the Griffiths Scales by examining the underlying dimensions of the Griffiths Scales using common factor analysis. The sample of South African children (N=430) between the ages of 54 and 83 months comprised White (n=90), Coloured (n=78), Asian (n=167) and Black (n=95) children. Data analysis was conducted for cultural groups separately and then factor solutions were compared to determine whether the Griffiths Scales measured similar or different constructs for the various groups. The correlation coefficients obtained for the South African sample were also compared to those of the British standardisation sample (Griffiths, 1970). Luiz et al. (1999) found that the Griffiths Scales appeared to measure one factor that is similar for White, Coloured, Asian and Black pre-school children. In addition, the pattern of correlation for South African and British children was also found to be similar, confirming that the Scales are measuring a construct that is consistent across cultures and through time (Stewart, 1997; Luiz et al., 1999).

Finally, Povey (2002) conducted a construct validity study of the original Griffiths Scales, examining the underlying dimensions tapped by the six subscales for children in Years V to VII. A sample of 180 children between the ages of 48 and 84 months were drawn from an existing database. The sample (N=60) for each group (year V, VI, & VII) consisted of boys and girls from the four cultural groups, namely, White, Coloured, Asian and Black (n=15 in each subgroup). A factor analysis was conducted separately for each year group and subscale. Povey (2002) concluded that, except for the Performance Subscale (for years V & VI), all other subscales tapped not single but complex skills, such as spatial and manipulation skills. This suggests that more than one construct is being tapped per subscale, and that these constructs seem to vary with these different age groups.

The above-mentioned studies, conducted in the United Kingdom, Canada and South Africa, suggest that there is ample support for the construct validity of the original Griffiths Scales. However, the same cannot yet be stated for the Revised Griffiths Scales.

In order to investigate the predictive validity of the Griffiths Scales, Worsfold (1993) correlated the Griffiths Scales' GQ and the six subscales with the Grade 1 performance of 124 pre-school children aged 5 years 6 months to 7 years. Equal number of boys and girls, as well as equal numbers of Black, White, Coloured and Asian children were included in the sample. Fairly equal proportions of upper, middle and lower socio-economic groups were also included in the sample. Worsfold (1993) found a contingency coefficient of $C = 0.51$ between the Griffiths GQ and Grade 1 performance, and contingency coefficients ranging from $C = 0.22$ to $C = 0.44$ for the six subscales and Grade 1 performance. All coefficients were significant at the $\underline{p} = 0.05$ alpha level, thus supporting the predictive validity of the Griffiths Scales in identifying scholastically and developmentally "at-risk" children.

Conn's (1993) study evaluated the performance of 107 children aged 4 years 0 months to 4 years 11 months on the Griffiths Scales and compared this with their performance at the end of Grade 1. The results revealed that the Griffiths results related to educational outcomes two or more years beyond the assessment, thus supporting the predictive validity of the Griffiths Scales in relation to educational outcomes at the age of seven years.

4.6.3. Pilot Normative Studies

As mentioned previously, the Extended Scales (Griffiths, 1970) were standardized on a fairly representative sample of 2260 children from England, Scotland and Wales. The mean quotients and standard deviations for each subscale are presented in the table below. The closeness to 100 for the means, and relative closeness of the standard deviations to 15 suggest that for each of the subscales a normal distribution was attained for the standardised sample.

Table 6: <u>Mean quotients and standard deviations of the Original Scales</u>

Subscale	Mean	SD
A. Locomotor Development	100.41	16.32
B. Personal-Social Development	100.26	16.20
C. Hearing and Speech	99.78	17.75
D. Hand and Eye Co-ordination	100.46	15.58
E. Performance Tests	99.87	17.21
F. Practical Reasoning	99.97	17.43
General Quotient	100.18	12.76

(Griffiths, 1970, p. 66)

However, recent studies have suggested that the population on which the Infant and Extended Scales were standardised may not necessarily represent a contemporary population (Allan, 1988, 1992; Hanson, Alridge-Smith & Hume, 1985; Hanson & Alridge-Smith, 1987; Huntley, 1996). Hanson, Alridge-Smith and Hume (1985) compared the performance of (N = 447) infants under the age of 2 years tested in 1980, with Ruth Griffiths' original 1950 sample. The mean performance of the 1980 children was approximately 10 points higher than the 1950 sample. Hanson and Alridge-Smith (1987) compared the Griffiths performance of N = 217 normal British children in the age group 3 to 8 years, tested between 1978 and 1982, with the 1960 standardisation sample. The results revealed large increases in the quotients for each of the subscales, except the Eye and Hand Co-ordination Subscale. The researchers attributed the low score on the Eye and Hand Co-ordination Subscale to the changes in educational policies and child rearing practices. Physical activities tend to be encouraged more than skills requiring quietness and concentration (Barnard, 2000).

Allan's (1988) study, investigating the suitability of the 1960 norms for White South African children is presented in the table below.

Table 7: Comparison of the 1960 norms and the performance of 5-year-old white South African children (N=60)

Subscale	South African	British 1960	British 1980
A. Locomotor Development	121.30	100.70	116.10
B. Personal-Social Development	109.20	100.40	112.60
C. Hearing and Speech	108.20	100.90	111.80
D. Hand and Eye Co-ordination	104.90	102.30	112.90
E. Performance Tests	112.30	101.40	113.30
F. Practical Reasoning	102.80	100.60	109.90
General Quotient	109.70	101.40	112.80

Findings revealed significant differences between the South African and British standardisation sample on the GQ, as well as on four of the six subscales, namely, the Locomotor, Personal-Social, Hearing and Speech and Performance Subscales. No significant difference was found when Allan (1988) compared the South African sample to a more contemporary British sample (Hanson & Alridge-Smith, 1987). Allan (1988) reported that socio-economic status was a factor in performance, with children from a higher socio-economic bracket performing better on the Griffiths Scales.

Mothuloe (1990) compared the Griffiths GQ of 45 Setswana-speaking children, between the ages of 5 years 9 months and 7 years, with those of the British standardisation sample of 1960. Mothuloe (1990) found that the mean scores for the South African Black children were similar to the means established in the 1960 normative sample. However, while the Black children in Mothuloe's (1990) sample may have performed on par with the 1960 sample, the performances of other cultural groups have surpassed the 1960 sample. Despite Mothuloe's (1990) findings that suggest that cultural group has an influence on the performance on the Griffiths Scales, later research by Allan (1992) and Bhamjee (1991) has revealed socio-economic status as being a significant factor impacting on performance, and not cultural group.

Bhamjee (1991) conducted a similar study to Allan (1988), comparing the performance of (N= 360) Indian South African children between the ages of 3 to 8 years to the 1960 British norms. Bhamjee (1991) reported that age and socio-economic status significantly influenced the sample's overall performance on the GQ and on four of the six subscales, namely, the Personal-Social, Hearing and Speech, Eye and Hand Co-ordination and Practical Reasoning Subscales. Gender differences were also observed for the GQ and on two of the six subscales, namely, the Locomotor and Performance Subscales. Once again, Indian South African children performed better than British children based on the 1960 norms, especially at the pre-school level. Therefore, based on the results of Allan (1988) and Bhamjee's (1991) studies, the usefulness and appropriateness of using the 1960 norms on South African children seems to be questionable.

While Allan (1988) and Bhamjee (1991) compared British norms with South African children of a particular group, Allan (1992) compared the performance of South African children from the four different cultural groups. The sample for the study included (N= 200) White, Black, Coloured and Indian children, between the ages of 5 and 6 years old. Allan (1992) found that there were no significant differences between the cultural groups with respect to the GQ, Personal-Social and Practical Reasoning Subscales. With respect to the other four subscales, Coloured and Black children performed similarly, as did White and Asian children. The only subscale on which White children performed significantly better, was the Hearing and Speech Subscale. Allan (1992) once again, confirmed the results from her prior study (1988), finding the socio-economic status was an important covariant influencing performance on the Griffiths Scales.

South African studies have produced contradictory findings when considering the influence of gender on the performance on the Griffiths Scales. Allan (1988) found no significant difference between the performance of 5-year-old White boys and girls. Mothuloe (1990), however, found that Black girls performed significantly better than Black boys on the Locomotor Subscale, which is an interesting finding, since it is generally accepted that boys are more superior in this area of development. Bhamjee (1991) found that South African Indian girls obtained significantly higher scores than Indian boys in respect of the Personal-Social Subscale. However, the contradictory results of the above-mentioned studies may be related to the cultural differences found in the samples which were drawn from different cultural groups. Before any conclusions are reached, more South African research needs to be conducted in this regard.

Huntley (1996) compared the scores of infants (N=665) living in urban areas (n=488) and rural areas (n=177) on the Griffiths Scales. Results revealed that children living in rural areas scored significantly lower than those in urban areas across all areas of development. The Personal-Social and Hearing and Speech Subscale were the most highly significant.

4.6.4. Case-Studies

Through studying profiles of a number of children, Griffiths (1984) identified prominent patterns, which can be used for diagnostic purposes. Krige (1988) conducted a longitudinal study of a physically disabled child. The child was assessed on the Griffiths Scales on four separate occasions, namely, at 38 weeks, and subsequently at 26,40 and 64 months. The study provided a comparison of the child's total potential with that of his age group and also highlighted his strengths and limitations.

Luiz (1988b) conducted an 18-month follow-up study with an assaulted child who was initially assessed at the age of 31 months. Assessed at the time of placement in foster-care and then 18 months thereafter, the Griffiths Scales revealed the extent to which a child, who has been removed from a destitute and unstable environment, can benefit from a caring and stimulating environment.

4.6.5. Profile Research

Lister (1981) recognised the clinical value and significance of using graphically presented profiles. Through profile analysis, a vulnerable child can be identified when compared with an established subtype profile. Areas of risk can then be identified and appropriate remediation can be recommended. The clarification of children's relative abilities and disabilities increases understanding of their behaviour and functioning at home, school and in social situations. In this way it allows for appropriate provisions to be made for the children's needs.

Lister (1981) described the developmental profile of 63 British children between the ages of 2 and 7 years, who were assessed over a two-year period on the original Griffiths Scales. Lister (1981) demonstrated the clinical usefulness of the developmental profile by describing case studies and posing a series of questions regarding the stability of profiles in relation to variables such as time, treatment and specific disabilities. The findings of the study supported Griffiths' (1970) suggestion that the Griffiths Scales can be used as a diagnostic tool.

Since Lister's (1981) study was based on British children, Luiz (1988d) replicated the study with a South African sample. The study aimed to obtain developmental profiles of young children between the ages of 2 years 6 months and 7 years 7 months. The results of the study confirmed the general effectiveness of the Griffiths developmental profile for White South African children and were comparable to those found by Lister (1981). In particular, differences between the children's use of language, verbal comprehension and expression (Subscale C), their eye and hand co-ordination (Subscale D) and their performance abilities (Subscale E) were identified.

By studying the profiles of a number of children, Griffiths (1984) identified prominent patterns, which can be used for diagnostic purposes. Griffiths (1984) stated that a deep trough on the Hearing and Speech Subscale could, for example, be associated with a hearing loss. Griffiths (1984) conducted three case studies on severely hearing impaired children between the age of 55 and 71 months, using the original Griffiths Scales. The results indicated that hearing impaired children tend to perform in the average range on the Locomotor (A), Personal-Social (B), Hand and Eye Co-ordination (D) and Performance (E) Subscales, while having fall outs on the Hearing and Speech (C) and Practical Reasoning (F) Subscales. The figure below highlights the developmental profile of one hearing impaired child as established by Griffiths (1984).

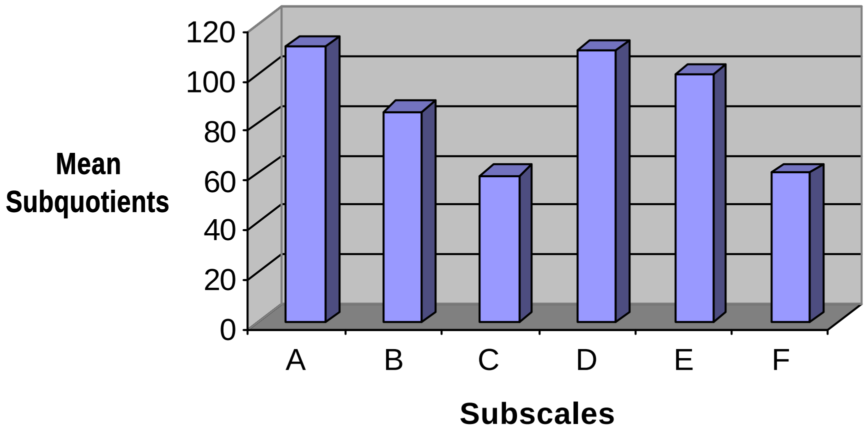


Figure 12: Profile of a 55-month-old hearing impaired child as established by Griffiths on the Original Griffiths Scales

Luiz (1988a) conducted a South African study on a 30 month old, moderately hearing impaired child. The child's progress was evaluated over a 3-year period, using the original Griffiths Scales. The results confirmed Griffiths' (1984) findings, namely, that the hearing impaired child performs average on the Locomotor (A), Personal-Social (B), Hand and Eye Co-ordination (D) and Performance (E) Subscales, while performing below average on the Hearing and Speech (C) and Practical Reasoning (F) Subscales (see figure 13). However, after intensive remedial intervention, significant changes were noticed in the child's developmental profile during the second assessment, twenty months later. What were the troughs at the first testing session became the peaks by the second testing sessions (Luiz, 1988a). At 65 months, the child presented with a more even profile and was considered ready for school (see figure 14).

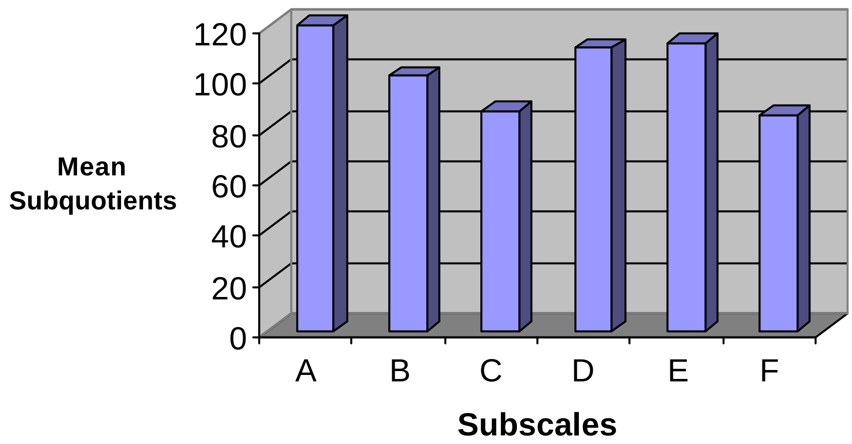


Figure 13: Profile of a 33-month-old hearing impaired child as established by Luiz (1988a) on the Original Griffiths Scales

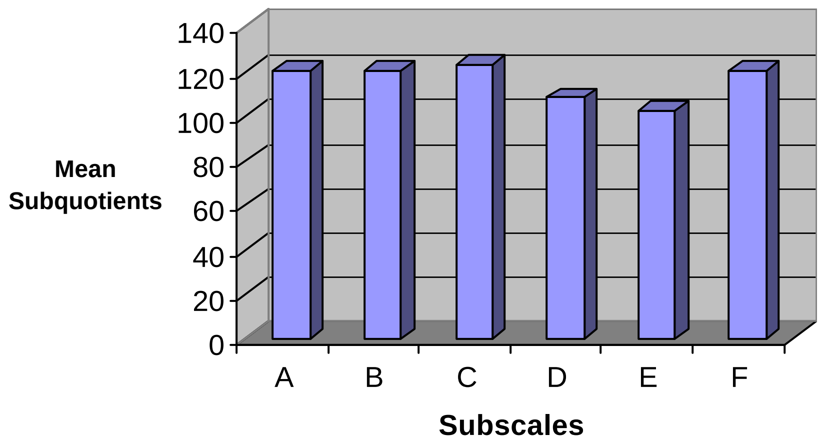


Figure 14: Profile of the hearing impaired child 35 months after the first assessment

Sweeney (1994) conducted a study to determine whether certain profile typologies could be derived from the Griffiths Scales in the South African context. The sample was drawn from a clinical database and consisted of 198 children, including younger children (n=46), aged between 2 years to 3 years 11 months, and older children (n=155), aged 4 years to 6 years (n=155). The findings of the study indicated that clinical typologies can be generated for South African pre-schoolers and early-scholars. More specifically, Sweeney (1994) identified three clusters of performance, namely, a high ability group, an average ability group and a low ability group.

Magongoa and Venter (2003) established the developmental profiles of children with idiopathic tonic-clonic epilepsy using the Original Griffiths Scales of Mental Development. Twenty-five children identified as tonic-clonic epilepsy sufferers, aged from 3 to 6 and a half years, were compared to twenty-five children without epilepsy. The samples were matched according to age, sex, location and socio-economic status. Although the epileptic children performed at a significantly lower level than the control group, their performance was mostly within the average range (Magongoa & Venter, 2003). The profiles for both groups were similar, with the highest scores on the Locomotor Subscale and the lowest on the Eye and Hand Co-ordination and Performance Subscales.

Using the Revised Infant Scales, Kotras (2002) conducted a study which aimed at exploring the developmental profile of Black HIV+ infected children in the Eastern Province of South Africa. The sample consisted of 74 infants in years 1 and 2. The infants were on no medication and came mostly from the low socio-economic strata. The results indicated that the general performance of the infants was low to below average on the Revised Infant Scales. The mean GQ, as well as the mean subquotients on each of the five subscales were lower for the infants in year 2 than those in year 1. Although the overall profile of the infants was generally average, the high range values 'normalized' the profile. Currently a follow-up study is being conducted on the HIV+ infected sample utilised in this study.

The present study will explore the developmental profiles of hearing impaired children on the Revised Extended Griffiths Scales. All the above-mentioned studies aim to determine the validity of utilising this assessment measure on clinical populations.

4.7. The Revision of the Griffiths Scales of Mental Development

Although there is an extensive amount of support for the Griffiths Scales, recent research has indicated a clear and urgent need for the revision of the Scales. Studies completed by Hanson (1982, 1983), Hanson and Alridge-Smith (1982; 1987), Allan (1988; 1992), Bhamjee (1991) and Povey (2002) have suggested that the 1960 norms are no longer valid. The items of the scale are outdated and several of the items are culturally biased and ambiguous (Kotras, 2003).

In March 1994, the Association for Research in Infant and Child Development (ARICD) held a conference for Griffiths Scales Tutors in Manchester, England, as an introduction to the revised Baby Scales (Huntley, 1996). At the conference the need to expand and co-ordinate efforts to revise the Extended Griffiths Scales of Mental Development was highlighted. Prof. D.M. Luiz of the University of Port Elizabeth (UPE) was appointed as the project director to revise and restandardise the Griffiths Extended Scales. A research proposal was submitted to the Executive Committee of the ARICD (Luiz, 1994b) resulting in the following objectives being established for the revision of the Extended Scales:

1. The basic qualities of the Griffiths Scales should be preserved: Throughout the revision process, the “child friendly” nature of the Scales should be preserved.
2. The age range of the Griffiths Scales should remain. The revision of the Infant Scales should be brought to finality. The revision of the Extended Scales should concentrate on the age range 2 years to 5 years, and then on the age range 5 years to 8 years.
3. The revision should involve international consultation of all tutors and interested members of the ARICD - a survey should be conducted of all ARICD members inviting them to identify the strengths and weaknesses of the Scales.
4. The revision should improve the content coverage of the Scales: The Scales should represent current theoretical and empirical work and the items should be relevant and contemporaneous. Statistical procedures such as cluster and factor analysis should be employed in the attainment of this objective.

5. Update the normative data on the Scale: Standardize the Scales on a contemporary sample that reflects the UK population in terms of ethnicity, gender and socio-economic status of the parents.
6. Update the psychometric quality of the Scales: Conduct reliability and validity studies, employing statistical procedures such as cluster and factor analysis.
7. Finally, enhance the clinical utility of the Scales by collecting data on children with a clinical diagnosis.

Since the induction of this large-scale project to revise the Griffiths Extended Scales, many of the above-mentioned objectives have already been met. Many studies have been completed to improve the content coverage of the Scales (Luiz, Collier, Stewart, Barnard & Kotras, 2000). Studies have also focused on the identification of problematic items, the writing of new items, the testing of the new items on a number of different samples, reviewing the children's performance on the new items and then re-testing the new items once more.

One of the first studies to undertake the objectives set out by Luiz (1994b) was an international survey relating to the strengths and weaknesses of the Griffiths Scales. A survey was conducted among a large sample of registered Griffith's users who frequently use the test (approximately 30 times per year) with an average of 5 years experience with the Griffiths Scales. Questionnaires were sent to 700 registered Griffith's users, and of those, 111 completed questionnaires were analysed. Respondents were asked to evaluate items where appropriate as good or poor on nine categories, namely: cultural bias, contemporaneity, order of difficulty, scale appropriateness, age appropriateness, instructions, administration, scoring and kit. A number of problematic items were identified. Subscale A (Locomotor) contained 23 problematic items, Subscale B (Personal-Social) had 21 problematic items, Subscale C (Hearing and Speech) had 24, Subscale D (Eye and Hand Co-ordination) had 2, while Subscale E (Performance) had only 1, and Subscale F (Practical Reasoning) had 7. Subscales A, B, and C were indicated as those in need of a more extensive revision. The table below presents the ten most problematic items identified by the Griffith's registered users.

Table 8: The ten most problematic items

Rank	Item	Item Description	Total Number of Negative Responses across the 9 Categories
1	BVI.3	Can go alone on errand to nearby shop	172
2	AV. 5	Can climb on and off a bus unaided	171
3	CIV. 1	Names 6+ objects in the big picture	135
4	CIII. 2	Picture vocabulary (12)	124
5	BIII. 2	At table uses spoon and fork	108
6	BV. 5	Can fasten show buckle	103
7	BIV. 5	Helps lay table: places a few items	102
8	AIV. 3	Marches in time to music	98
9	CVI. 4	Knows 10+ capital letters	91
10	CV. 6	Names 12 objects in big picture	90

It is evident that users of the Scales find certain items culturally biased and out-dated. The social world of children in the 1990s has changed drastically to that of the children during the 1960s when the Scales were standardised. Due to recent increases in urban terrorism, child abduction and abuse, many parents consider it too dangerous to let their young children take a bus unaccompanied or go alone on errands, even to neighbourhood shops. Clinicians have also become sensitised to the items that measure culture-bound social practices such as letting children help lay the table or eating with cutlery (Luiz, et al., 1995). As the test is used in diverse settings in both first and third world contexts (Hanson & Alridge-Smith, 1982; Victoria, Victoria & Barros, 1990; Allan, Luiz & Foxcroft, 1988; 1992), it is imperative that elements of the test require separate, context-specific revision of certain test items. If accurate developmental assessments of children from diverse backgrounds are desired, the adaptation of certain items for the different contexts in which the test is used is vital (Luiz et al., 1995).

In order to establish which items were problematic, a 10-point weighted scoring system was developed. While the majority of the items were found to be acceptable, some were identified as being problematic. Some of the problematic items were in need of complete replacement, while other items required modification in order to make them more acceptable and contemporaneous. The modification of an item entailed either the modification of its content, wording, administration or scoring procedures. Appendix A contains a list of all the items that were in need of replacement or modification.

Once the problematic items had been identified, a plan to develop new items and to modify existing items had to be established. The following procedure was adhered to:

1. Creation of new items: For each item selected as problematic, a number of possible new items were written. Various experts in the field of child development were requested to submit items for consideration as new items.
2. Revision of new items: Once a sufficient number of new items had been suggested, they were submitted to a panel to check for culture and gender fairness.
3. Piloting the new items – phase one: New items that were established to be culture and gender fair were administered to a small sample of children in South Africa and analysed. Only White children were represented in the sample as research has suggested that they match the performance of UK children on the Griffiths Scales (Allan, 1988), thereby allowing international comparisons to be made tentatively.
4. Piloting the new items- phase two: Items with superior item characteristics identified in phase one were included, along with additional experimental items, for re-testing on a new sample of South African children. The results were once again statistically analysed. As in phase one, only children from the white cultural group were represented in the sample.

5. Piloting the new items- phase three: Finally, the most superior items derived form the two pilot tests, along with old experimental items of the Extended Griffiths Scales, were administered to a large sample of South African children. A biographical questionnaire was included to collect information on the children's developmental history, socio-economic status, personal and social development. In addition, a neurological checklist was also completed to aid in the screening of children whose development was classified as not within the normal range.
6. Lastly, the new experimental version of the Extended Scales was submitted to the ARICD for their comments and approval.

Appendix B, C, and D contains a list of the items that were replaced, modified or where scoring or times have been improved.

Many items on the Hearing and Speech Subscale (Subscale C) have been identified as being problematic (Hanson, 1982; Luiz et al., 1995). Taking the findings of Hanson (1982) and Luiz et al. (1995) into consideration, Kotras (1998) revised the small pictures and large picture of the Hearing and Speech Subscale in South Africa. The study resulted in the development of 20 new small pictures and two new large pictures (one having a contemporary British/European/ Australian focus, and one having a contemporary South African focus). The new versions were developed by a local artist who is familiar with the study and the Griffiths Extended Scales.

In 2003 Kotras extended her study and explored the construct validity of the Language Subscale of the Revised Extended Griffiths Scales. The sample consisted of 325 English-speaking children throughout the British Isles and Eire, between the ages of 24.3 and 95.7 months. The results of the study confirmed that the subscale measures comparable constructs in individuals of different socio-economic and gender groups.

Barnard (2000) revised the Practical Reasoning Subscale of the Griffiths Extended Scales. The total sample represented six age groups (years 3, 4, 5, 6, 7 and 8) and four cultural groups (Asian, Black, Coloured and White), as well as developmentally normal and abnormal children. Following the analyses and critical consideration by the research team, 10 of the experimental items and 11 adapted original items were included in the revised subscale, which has improved the content covered and the contemporaneous nature of the items of the subscale.

Finally, Knoesen (2003) assessed 93 urban pre-school children between the ages of 5 years and 6 years 11 months on the Revised Griffiths Scales to determine whether the Scales can be used to predict scholastic performance of Grade 1 learners. The children were tested towards the end of their final year and were then followed up one year later by gathering their school reports and learner profiles at the end of their Grade 1 year. Results suggest that the Revised Griffiths Scales can be used to identify strengths and weaknesses in Grade 1 learners in the outcomes-based system of education in South Africa. Like previous research, these results also revealed differences between gender, cultural and socio-economic status. Girls performed better than boys, White and Asian children performed similarly and Coloured and Black children performed similarly. Children from higher socio-economic status performed better than children from lower socio-economic status (Knoesen, 2003). The study added support to the value of using the Revised Griffiths Scales to predict the scholastic performance of Grade 1 learners.

4.6. The Standardisation of the Revised Extended Scales

The standardisation of the Revised Extended Scales is the accountability of a multifaceted team of international researchers. This team includes an international director of research, assisted by two researchers in South Africa (SAGRT), regional co-coordinators and examiners. Regional researchers have been appointed for England, Wales, Scotland, Northern Ireland and Southern Ireland.

The standardisation of the Revised Extended Griffiths Scales is currently being conducted in the UK on a stratified random sample of 1100 children between the ages of 2 years and 8 years and from various socio-economic groups. Proportionate representations of children have been gathered from England, Scotland, Wales, Northern and Southern Ireland. Once the restandardisation of the Revised Griffiths Scales is complete in the UK, researchers will begin working on the restandardisation of the Scales in South Africa.

4.7. Chapter Overview

This chapter has provided a review of the Griffiths Scales and has illustrated that this assessment measure meets the requirements to comprehensively assess the development of infants and pre-school children. The Griffiths Scales have been used in case studies (e.g., Krige, 1988; Luiz, 1988a; 1988b), correlational studies (e.g., Heimes, 1983; Lombard, 1989; Luiz, 1988c; Mothuloe, 1990; Stewart, 1997; Worsfold, 1993), pilot normative studies (e.g., Allan, 1988, 1992; Bhamjee, 1991) and validity studies (e.g., Luiz et al., 1995). The above-mentioned studies have recognised the indispensable role that the Griffiths Scales have fulfilled in the assessment of South African children of all cultural and socio-economic groups. Today, the Griffiths Scales are amongst the most widely researched tests for the assessment of infants and young children in the world (Luiz, 1994a). The present study aims to further enhance the clinical validity of the Revised Griffiths Scales by collecting and analysing data on children with a clinical diagnosis of hearing impairment.

CHAPTER FIVE: RESEARCH METHODOLOGY

5.1. Problem Formulation

International research has found that hearing loss is the most frequently occurring birth defect (Chapiro, Feldmann, Denoyelle, Sternberg, Jardel, Eliot, Bouccara, Weil, Garabedian, Couderc, Petit & Marlin, 2002; Lin, Shu, Chang & Bruna, 2002). In Chapter 1 the rationale for the present study was discussed, while Chapter 2 highlighted the far reaching effects that a hearing loss can have on the development of a child's cognition, psychosocial and verbal communication skills.

According to Kotras (1998) language is of central importance in children's development and is vital for their success at school and the world beyond. With the result, communication is the most significant concern with regard to the development of a hearing impaired child. The extent to which a child may develop receptive and expressive language skills has a great deal to do with the amount of residual hearing the child has. Other variables, which affect the ability of the child to maximise his/her residual hearing, depend on: (a) how early in life the hearing loss occurred; (b) when the hearing loss was identified; and (c) how and when intervention in the form of amplification mechanisms and parent guidance was provided (Luciano, 1994).

Humans have a special need for communication, and happiness and satisfaction go hand-in-hand with the ease by which we transmit and receive information. The process of developing language competency is very difficult for hearing impaired children and for some, full language acquisition may be feasible, while for others, more limited or even no language skills will have to be acceptable (Northern & Downs, 2002). Researchers have repeatedly mentioned the importance of early identification and intervention so as to maximise not only communicative competence and literacy development but also general development. Various developmental assessment measures were thus discussed in Chapter 3.

Despite South Africa being a country where a significant number of infants and children are hearing impaired, limited research to assess their general development has been conducted on this clinical population. Speech and hearing therapists feel that many of the assessment measures used on hearing impaired children are verbally loaded and therefore do not reflect the true ability of these children. Chapter 4 highlighted that the Griffiths Scales have proven to be useful among clinical populations and are thus a useful assessment measure to use in the present study (Kotras, 1998). The Griffiths Scales do not only rely on tasks that are dependent on verbal instructions, questions or language concepts, a feature vitally important for hearing impaired children as they are at a disadvantage in any test which has a large verbal component (Kyle, 1998). The measure allows the tester to be demonstrative in gesture and in facial expressions, assisting the communication process with a hearing impaired child. Providing demonstrations and manually guiding the child through practice items assists the child with the comprehension of instructions. The Griffiths Scales thus have the potential to provide a truer reflection of the hearing impaired child's abilities. If the hearing impaired child's language is very limited, the tester may decide not to include the language subscale and to rather assess each of the other five subscales separately and interpreting the results accordingly, using the scores diagnostically and part of a profile.

The current study aimed to identify the characteristic patterns of cognitive, social, emotional and physical development found in hearing impaired children. By highlighting the developmental strengths and weaknesses of hearing impaired children, the findings of the study will assist the children to develop in a manner, which will assist them to reach their full potential. By identifying the children's developmental weaknesses, therapeutic programmes can be developed which will allow appropriate intervention to address any skill deficits present. This, in turn, may boost the child's social, emotional and educational development and may prepare the groundwork for formal learning either in mainstream or in a special school.

Although Griffiths (1984) established a developmental profile for hearing impaired children on the Original Griffiths Scales, to date only one South African case study has been conducted on a hearing impaired child (Luiz, 1988a). With the revision of the Scales, a new developmental profile needs to be established. This study will therefore contribute to identifying whether hearing impaired children can be successfully assessed on the Revised Extended Griffiths Scales. Results will also bring to the fore possible strengths on which the children can capitalise and possible areas of concern on which more attention should be focused.

5.2. Specific Aims / Primary Objectives

This study forms part of an ongoing investigation into the use of the Revised Extended Griffiths Scales in South Africa. More specifically, the focus was on using the Revised Extended Griffiths Scales to assess a clinical population, namely, hearing impaired children in their early pre-school years. The primary aim of the study was to describe the developmental profile of hearing impaired children between the age of 36 and 95 months attending the Carel du Toit Pre-School in the Western Cape, South Africa. The specific aims of the study thus were:

1. To explore and describe the hearing impaired sample's overall general development.
2. To explore and describe the hearing impaired sample's performance on each subscale of the Revised Extended Griffiths Scales.
3. To compare the hearing impaired sample's performance with that of a normal sample on all the subscales of the Revised Extended Griffiths Scales.
4. To compare the performance of the hearing impaired sample with amplification and/or bone conduction, with the performance of the normal sample.
5. To compare the performance of the hearing impaired sample with cochlear implants, with the performance of the normal sample.

5.3. Research Method

In order to achieve the primary and first two aims of the current study, a quantitative, exploratory-descriptive research design was employed. The aim was to describe the performance of Black, Coloured, Asian and White hearing impaired pre-school children between 36 and 95 months of age, from two language (English and Afrikaans) and three socio-economic groups (upper, middle and lower) in terms of their responses on the 6 subscales of the Revised Extended Griffiths Scales. Using the collated data, a description of the children's physical, emotional, social and cognitive development could then be provided.

In general the study was quantitative in nature as the data collected and analysis thereof was primarily numerical. The study was descriptive since it aimed to describe the performance of a specific group, namely, hearing impaired children, in a particular context, that is, a pre-school geared for hearing impaired children (Christenson, 1994). Since the study was descriptive, no prior research hypotheses were stated. The numerical data obtained was statistically summarised to make them more easily interpretable. Inferences were excluded, as the researcher merely wanted to describe the sample's developmental profile. The advantage of a descriptive approach is that it is specific and objective. The disadvantages are that there is no way of controlling for extraneous variables and consequently no cause-and effect conclusions can be drawn (McGuigan, 1990).

Exploratory-descriptive research thus attempts to observe, record and describe the behaviour of interest, which is a primary and necessary goal for the development of scientific knowledge (Cozby, 1993). Exploratory-descriptive research is also advantageous in that it increases one's understanding of a particular field or construct, and allows for the development of theory.

The third aim, namely, to compare the performance of the hearing impaired sample with that of a normal sample was achieved by means of a between groups comparison, using a variation of a matched groups design. The aim was to investigate whether the development of hearing impaired children differs significantly from the development of normal children. By matching the hearing impaired sample to the normal sample in terms of age, socio-economic status and culture, the two samples were sufficiently similar to justify inter-group comparisons. Research on the Griffiths Scales has repeatedly shown that these three variables influence test performance (Allan, 1988, 1992; Bhamjee, 1991). Unique matches could be found for 41 of the total 58 hearing impaired children.

Aims five and six were achieved by means of a between groups comparison, using a variation of a matched groups design. 27 of the hearing impaired children with amplification and/or bone conduction were matched to the normal sample, while 15 matches were found for the hearing impaired children with cochlear implants. The tables below provide a summary of the two matched samples.

Table 9: Matched sample breakdown of the hearing impaired and normal sample in terms of age, cultural group and socio-economic status

		Normal Sample (N=41)	**Hearing Impaired Sample (N=41)**
Age:		61.0 months	60.2 months
Cultural Group:	White	18 (43.9%)	18 (43.9%)
	Coloured	17 (41.5%)	17 (41.5%)
	Black	1 (2.4%)	1 (2.4%)
	Asian	5 (12.2%)	5 (12.2%)
SES:	Upper	17 (41.5%)	17 (41.5%)
	Middle	15 (36.6%)	15 (36.6%)
	Lower	9 (21.9%)	9 (21.9%)

Table 10: Matched sample breakdown of the hearing impaired children with amplification and/or bone conduction and the normal sample in terms of age, cultural group and socio-economic status

		Normal Sample (N=27)	Hearing Impaired Sample with Amplification (N=27)
Age:		59.4 months	59.1 months
Cultural Group:	White	9 (33.3%)	9 (33.3%)
	Coloured	12 (44.4%)	12 (44.4%)
	Black	1 (3.7%)	1 (3.7%)
	Asian	5 (18.6%)	5 (18.6%)
SES:	Upper	11 (40.7%)	11 (40.7%)
	Middle	11 (40.7%)	11 (40.7%)
	Lower	5 (18.6%)	5 (18.6%)

Table 11: Matched sample breakdown of the hearing impaired children with cochlear implants and the normal sample in terms of age, cultural group amd socio-economic status

		Normal Sample (N=15)	Hearing Impaired Sample with Cochlear Implants (N=15)
Age:		62.9 months	59.1 months
Cultural Group:	White	8 (53.3%)	8 (53.3%)
	Coloured	4 (26.7%)	4 (26.7%)
	Black	1 (6.7%)	1 (6.7%)
	Asian	2 (13.3%)	2 (13.3%)
SES:	Upper	7 (46.6%)	7 (46.6%)
	Middle	4 (26.7%)	4 (26.7%)
	Lower	4 (26.7%)	4 (26.7%)

South African research on the Griffiths Scales has indicated that numerous variables such as culture, age and socio-economic status are variables that affect test performance (Allan, 1988, 1992; Bhamjee, 1991; Hanson et al., 1985). Hearing impaired children are found in all socio-economic classes, cultural groups and regions throughout South Africa. In view of this, as well as to allow for meaningful description of test results, an attempt was made to control important extraneous variables such as culture, age and socio-economic status by either holding them constant or by building them into the design. Possible extraneous variables, and the manner in which they were controlled, will be discussed below.

- **Status of Sensory Development**

This potential confounding variable was controlled by only including hearing impaired children in the clinical sample of the study. An Ear, Nose and Throat Specialist diagnosed all children. However, differing amplification methods, namely, bone conductors, hearing aids or cochlear implants were used by the children to aid in hearing.

- **Urban-rural residence**

Large differences exist between the rural and urban South African population (Jansen, 1991). Urban-rural residence has been found to have differential effect on cognitive test performance (Allan, 1992). This extraneous variable was therefore controlled by building it into the design and selecting only subjects for the clinical sample who live in urban areas in and around Cape Town.

- **Educational Exposure**

Differences in the level and quality of education often affect cognitive test results (Allan, 1992). Only children attending the Carel du Toit Pre-School were therefore selected for the clinical sample. In this manner this unique type of educational exposure was controlled for. All the children included in the sample had attended a parent guidance programme and were exposed to an auditory-oral habilitation tuition, using programmes with the same format, namely, experiential activities with defined language related goals.

- **Age**

Previous research has shown that age influences the performance on the Griffiths Scales. Bhamjee (1991) found that age specifically influenced the overall performance of a child on the GQ and on four of the six subscales, namely, the Personal-Social, Hearing and Speech, Eye and Hand Co-ordination and Practical Reasoning Subscales. It was hypothesised that the hearing impaired sample would have fall-outs on the Hearing and Speech as well as on the Practical Reasoning Subscale as language plays a prominent role in both of these subscales. As a result, only hearing impaired children within the age range of 36 and 95 months were included in the clinical sample. The hearing impaired and normal sample were also matched according to this variable.

- **Culture**

Cultural norms influence the pattern of development in children (Allan, 1992). What is considered appropriate behaviour for a young child in one culture may be inappropriate in another culture. Different developmental experiences across the cultural groups may thus lead to differences in the behaviour of children from different cultural backgrounds (Jansen, 1991). Forms of behaviour that may vary from one culture to another are, for example, religious beliefs and practices, the predominant language spoken, as well as moral and ethical attitudes and practices. Furthermore, there are many differences across cultures in delivery, post-natal care, rearing of infants and child-rearing practices in general, which may all affect the development of the infant and young child.

South African studies have found contradictory result with regards to the influence that culture has on an individual's performance on the Griffiths Scales, but the majority seem to illustrate that culture has a strong influence on test performance and the hearing impaired sample was therefore matched to the normal sample according to this variable (Allan, 1992). Due to the purposive sampling procedure employed in the present study, it was not possible to control for this variable by including equal numbers of Black, Coloured, Asian and White children. The clinical sample breakdown, however, represented the cultural groupings at the Carel du Toit Pre-School.

- **Socio-economic Status (SES)**

Research findings have demonstrated that SES differences influence performance on a variety of measures for children from all cultural groups (Allan, 1992; Bhamjee, 1991). Children from the different SES groups have different opportunities and access to both social and educational facilities.

Consequently this variable was controlled for in the present study and used to match the hearing impaired sample to the normal sample.

The SES of the participants was determined by using Riordan's (1978) socio-economic classification system. Riordan (1978) set boundaries for upper, middle and lower classes for South African Black, Coloured, Asian and White population groups, based on the family breadwinners' educational achievements and occupational status. Foxcroft (1985) suggested that educational level provides a far more reliable indicator of socio-economic status than does the level of income, since the former is unlike to evoke the emotional responses that questions concerning income might.

The first variable, namely, education was considered important because it is reported that there is a high correlation between the education of the head of the house, family income and occupational status of the household head (Dohrenwend, 1973). The primary caregivers of the hearing impaired children were required to record their highest educational standard and this was then converted to a numerical value according to the system devised by Riordan (1978) as presented in Table 12.

Table 12: Riordan's classification of breadwinner's education

Father's education	**Score**
University attendance	7
Post-matric training (not university)	6
Matric	5
Apprenticeship	4
Junior certificate	3
Primary school	2
None at all	1
No response	0

The second variable, namely, occupation was determined by assigning Riordan's (1978) numerical value to each occupation. This occupational scale is presented in Table 13.

Table 13: Riordan's classification of breadwinner's occupation

Occupational classification	Score
Top professional, executive, administrative and technical occupations	9
Professional, administrative and managerial workers	8
Independent commercial	7
Lower grade administrative, technical, clerical with limited supervisory and administrative responsibility	6
Artisans and skilled workers with trade qualifications	5
Routine clerical and administrative workers, service and sales workers	4
Semi-skilled production and manual workers	3
Unskilled production and manual workers	2
Not economically active or productive	1
No response	0

The boundaries set by Riordan (1978) for the upper, middle and lower socio-economic levels were set arbitrarily since the Population Consensus of 1970 yielded a vastly discrepant representation of the different cultural groups in terms of occupational, educational and income categories. Since there seemed no other way of establishing social class boundaries in the cultural groups involved in the present study, Riordan' s cut-off points for determining socio-economic class were used, and these are presented in Table 14.

Table 14: Riordan's classification of socio-economic status

	Lower	Middle	Upper
Black	2-5	6-10	11-16
Coloured	2-6	7-10	11-16
Indian	2-6	6-10	11-16
White	2-10	11-13	14-16

Keeping the mean numeric value assigned to the parental educational and occupational level the same for the different cultural groups controlled the influence of SES. It must, however, be noted that socio-economic deprivation is not equally distributed for South African Blacks, Coloureds, Indians and Whites. In the past, the SES of South African Blacks was, for example, generally lower than that of the other groups. Representative samples of South African Blacks, Coloureds, Indians and Whites will thus not be equivalent in terms of SES.

- **Gender**

It is generally accepted that developmental differences exist between boys and girls (Hetherington & Parke, 1979; Santrock, 2001). Examples of such differences mentioned by the authors are: (a) the superiority of boys with increasing age in activities involving gross motor skills; and (b) the superiority of girls as far as fine motor skills and verbal abilities are concerned. As discussed in Chapter 4, South African research has produced contradictory findings in respect of the influence of gender on the performance on the Griffiths Scales. A recent study conducted by Knoesen (2003) found that girls performed better than boys on the Griffiths Scales. For this reason an attempt was made to include approximately equal number of boys and girls in the study, however, due to the sampling procedure this was not fully achieved.

- **Language**

Allan (1992) stated that various researchers have identified the important role of language with regard to psychometric test results. Language and culture usually go hand in hand. As the home languages of all the cultural groups included in this study differed, it was not possible to hold the influence of this variable constant. However, the children were assessed using their home language, namely, English or Afrikaans.

Despite the effort to control various extraneous variables, children with a hearing loss represent a heterogeneous population (Diefendorf, 1996). Variables such as the type and degree of hearing loss; the age of onset; the type and consistency of amplification; the intervention received as well as the existence of any co-morbid conditions, have a definite impact on the hearing impaired child’s developmental outcome. All these factors, as well as gender and language, could not be controlled for and must be acknowledged as a limitation of the study.

5.4. Participants

5.4.1. Sampling Procedure of the Hearing Impaired Participants

Non-probability sampling, specifically purposive sampling, was employed to select the hearing impaired sample for the present study. In non-probability sampling, the probability of any particular member of the population being selected is not known (Graziano & Raulin, 2000). In purposive sampling, the procedures are directed toward obtaining a certain type of element (Dane, 1990) and the researcher uses his or her own judgement about which respondents to choose, selecting only those who best meet the purpose of the study. The advantages of using a non-probability purposive sampling method include the ease with which it can be carried out (Graziano & Raulin, 2000), its cost effectiveness and practicality, as the researcher uses his or her research skills and prior knowledge to select respondents appropriately (Cozby, 1993). The disadvantage, however, is that the sample may not be a representative sample of the population, and the results may therefore be biased (Graziano & Raulin, 2000). External validity is thus limited and generalisability is reduced (Dane, 1990). However, as this study is descriptive and exploratory, external validity is not of key importance.

5.4.2. Description of the Hearing Impaired Sample

The clinical sample included in the present study comprised 58 hearing impaired children attending the Carel du Toit Pre-School in the Western Cape, South Africa. The Carel du Toit Pre-School was specifically chosen for this study as an oral form of language tuition is used to teach language, contrary to signing as a method of communication. Furthermore, all categories of deafness, ranging from mild to profound, were represented in the pre-school. For admission to this pre-school programme, the school requires that:

- the child is at least 3 years old;
- the primary disability must be a hearing loss;
- the child should be able to benefit from some form of amplification;

- parental involvement is imperative and the parent must attend the guidance programme for as long as it is required by the school; and
- the child must have been diagnosed by an Ear, Nose and Throat Specialist as hearing impaired.

All hearing impaired participants included in the study were representative of the Black, Coloured, Asian and White races present at the pre-school and spoke either English or Afrikaans. The participants were representative of the lower, middle and upper socio-economic groups living in the urban areas in and around the Western Cape. At the time of assessment all participants had only been exposed to oral language as a means of communication, but English and Afrikaans participants were taught in their home language in different classes using the same method of instructions. Table 15 provides a summary of the hearing impaired sample in terms of the mean age range, cultural groups, socio-economic status, language group and gender.

Table 15: Hearing impaired sample breakdown in terms of age, cultural group, socio-economic status, language group and gender

		Hearing Impaired Sample (N=58)
Mean Age Range		**58.04 months**
Cultural Group:	White	23 (40%)
	Coloured	26 (45%)
	Black	1 (2%)
	Asian	8 (13%)
SES:	Upper	19 (33%)
	Middle	19 (33%)
	Lower	20 (34%)
Language Group:	English	31 (54%)
	Afrikaans	27 (46%)
Gender:	Male	25 (43%)
	Female	33 (57%)

The mean age of the participants was 58.04 months (standard deviation of 12.05 months), with a minimum and maximum age of 37.60

months and 85.70 months respectively. The graph below represents the breakdown of the sample into the various year groups.

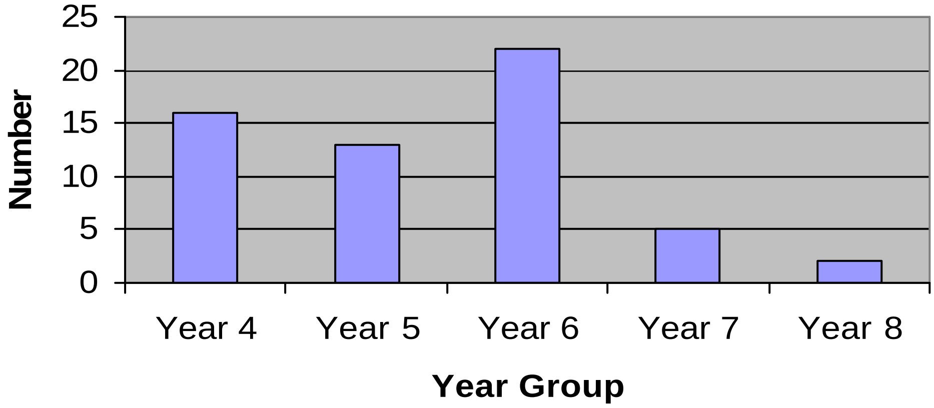


Figure 15: Sample breakdown in terms of year groups

Achieving an equal distribution for the cultural groups was difficult as all children currently attending the Carel du Toit Pre-School, and who met the inclusion criteria, were included in the sample. The unequal distribution of cultural groups will consequently have to be taken into account when interpreting the results. Figure 16 represents a graphic illustration of the sample in terms of cultural groups.

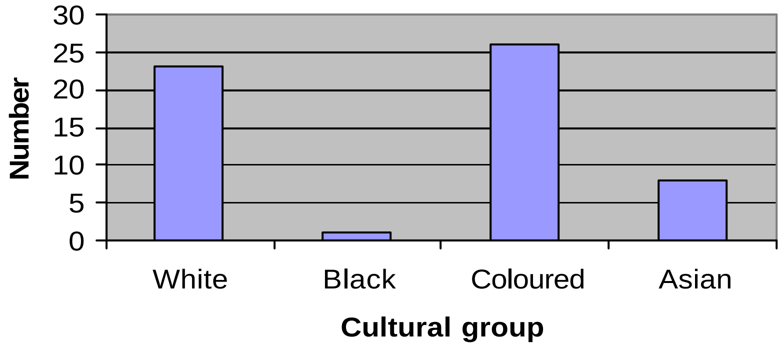


Figure 16: Sample breakdown in terms of cultural groups

Although a purposive sampling technique was used, the distribution of the lower, middle and upper socio-economic class groups was fairly equal (lower = 34%, middle = 33% and upper = 33%). The figure below provides a graphic representation of this distribution.

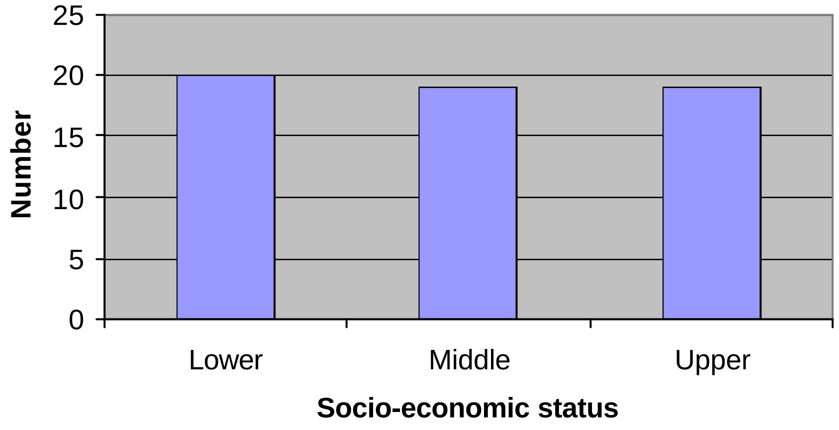


Figure 17: Sample breakdown in terms of socio-economic status

The hearing impaired sample consisted of relatively equal numbers of English and Afrikaans speaking children. The one Black child was English speaking, and thus assessed in English, as the Carel du Toit Pre-School requires that all children either speak English or Afrikaans at home. Figure 18 indicates the language breakdown of the hearing impaired sample.

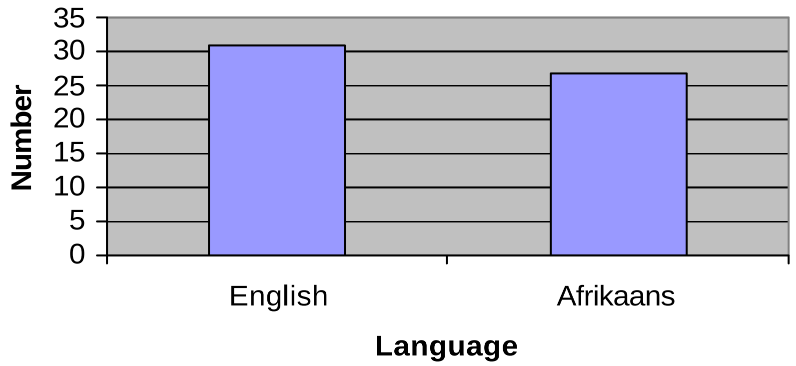


Figure 18: Sample breakdown in terms of language

Relatively equal number of girls (N = 33) and boys (N = 25) were included in the sample. Refer to Figure 19 for a graphic illustration of the sample breakdown in terms of gender.

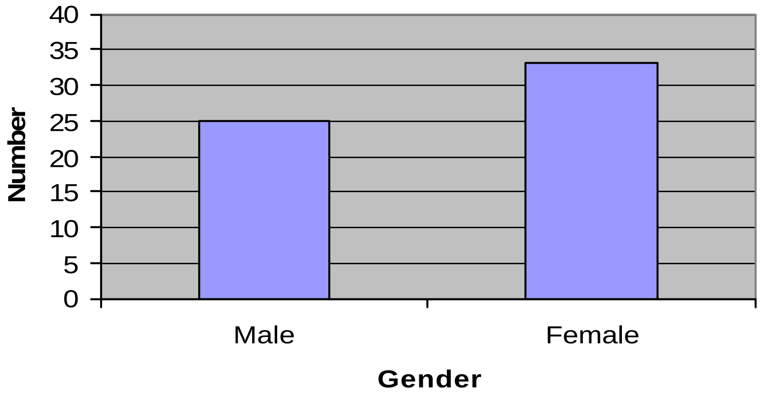


Figure 19: Sample breakdown in terms of gender

When looking specifically at the hearing impairment, the majority of the sample (N = 42) suffered from a severe to profound hearing loss. 9 children suffered from a moderate to severe hearing loss while 7 children suffered from a mild to moderate hearing impairment. Figure 20 provides a graphic illustration of the severity of the hearing loss of the participants included in the sample.

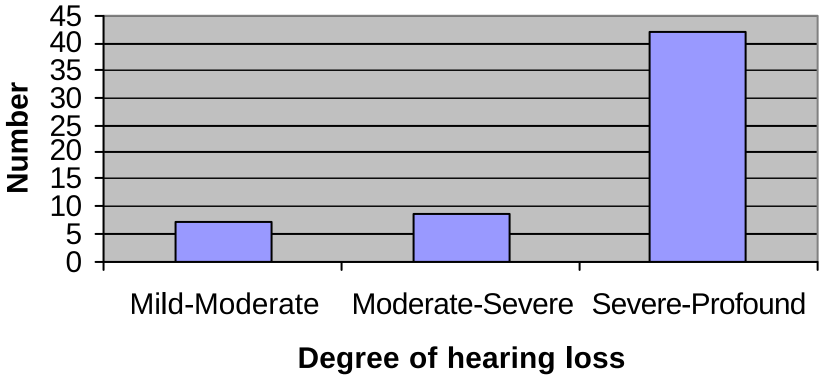


Figure 20: Sample breakdown in terms of degree of hearing loss

Research has emphasised the importance of early diagnosis as most progress has been seen if an infant or young child has been diagnosed with a hearing loss in the first 6 months of his/her life (Northern & Downs, 2002). From the table below one can conclude that 38% of the sample was diagnosed in their first year, 28% during their second year, 19% during their third year, 10% during their fourth year and 5% thereafter. Table 16 illustrates when the children in the sample were diagnosed with a hearing loss.

Table 16: A breakdown in terms of when the children were diagnosed with a hearing loss

Diagnosis	Number of Whole Sample (N = 58)
0 – 12 months	22 (38%)
12 – 24 months	16 (28%)
24 – 36 months	11 (19%)
36 – 48 months	6 (10%)
> 48 months	3 (5%)

Research has also emphasised the importance of early intervention once a hearing loss has been identified. The majority of the sample (N = 17) joined the parent guidance centre at the Carel du Toit Pre-School between the ages of 12 and 24 months. The table below provides a summary of the time frames of when the participants entered the pre-school.

Table 17: Sample breakdown in terms of the age at which the children entered the Carel du Toit Pre-School

Age at which entered Carel du Toit Pre-School (in months)	Number of Whole Sample (N = 58)
12 – 24 months	2 (3%)
24 – 36 months	19 (33%)
36 – 48 months	23 (40%)
48 – 60 months	8 (14%)
60 – 72 months	3 (5%)
Visitor	3 (5%)

38 of the 58 children assessed, made use of a hearing aid and/or bone conductor, while the remaining 20 are using a cochlear implant in order to hear. A common trend is to also divide the causes of hearing impairment into three categories, namely, prenatal, perinatal and postnatal. The cause for 24% of the sample is unknown. 47% of the prenatal causes were responsible for the samples hearing impairment, while for 10% the causes were perinatal and the remaining 19% postnatal.

A child with a hearing impairment may suffer from a co-morbid condition which further has an impact on his/her development. A number of the children tested suffered from a co-existing disorder such as cerebral palsy, severe visual problems, ADD or social and emotional problems such as separation anxiety or overprotection. The majority of the sample (N = 38) receive intervention from multiple professionals such as speech therapists and occupational therapists. 3 children only receive intervention from an occupational therapist, while 15 only receive assistance from a speech therapist.

As mentioned previously, parental involvement also plays a vital role in assisting the child to develop to his/her fullest potential. 51.7% of the parents are actively involved in the programme, while 31.1% show limited input and 17.2% have been reluctant to participate at all.

5.4.3. Description of the Normal Sample

The sample of hearing impaired children was compared to a normal sample, where normalcy has been broadly defined as: "an absence of any sensory, physical or mental handicap" (Luiz et al., 2000). The data of the normal sample was drawn from an existing database, which has been created for the revision of the Griffiths Scales.

The normal sample was collected from South African crèches, pre-schools and primary schools in and around Port Elizabeth. Articles were written, and advertisements were placed in local newspapers, informing parents of the study and inviting them to bring their children to the University Clinic for assessment on the Extended Scales. Word of mouth played an important role in informing parents of pre-school children about the developmental assessment. The children were tested by master degree students, who had attended a registered Griffiths Training Course.

To facilitate the collection of the normal sample, a biographical questionnaire was used to gather information on the child's developmental history, as well as socio-economic status. In addition, a neurological checklist was also included to aid in the exclusion of children whose development was classified as not within the normal range. Only children who were considered to have a normal birth and developmental history, according to the Biographical Questionnaire and Neurological Checklist designed by Foxcroft (1985), were included in the normal sample.

The normal sample included children from each of the age groups of the Extended Scales. The age category cut-points were set at: Year 3 (24 to 35.9 months), year 4 (36 to 47.9 months), year 5 (48 to 59.9 months), year 6 (60 to 71.9 months), year 7 (72 to 83.9 months), and year 8 (84 to 95.9 months). A quota sampling method was used. For each age group, male and female children from each of the four ethnic groups were included. 42 of the total 201 developmentally normal children were drawn from the database for matching purposes. Table 18 represents a breakdown of the normal sample in terms of age, gender, language, culture and socio-economic status.

Table 18: Breakdown of the normal sample in terms of age, gender, language, culture and socio-economic status

		Normal sample (N=44)
Mean age range		60.6 months
Gender:	Male	17 (38.6%)
	Female	27 (61.4%)
Language:	English	24 (54.5%)
	Afrikaans	18(41.0%)
	Xhosa	2 (4.5%)
Cultural group:	White	18 (41.0%)
	Coloured	17 (41.0%)
	Black	2 (4.5%)
	Asian	7 (15.9%)
SES:	Upper	18 (41.0%)
	Middle	16 (36.4%)
	Lower	10 (22.6%)

5.5. Measures

5.5.1. Biographical Information

The parents of the hearing impaired participants granted permission to access the clinical files at the pre-school. The clinical files were used to gain additional information regarding the participants' birth history; gender; race; age; home language and socio-economic status. Bi-annual teacher's reports, multidisciplinary discussions on pupils, parent interviews and reports from professionals such as occupational therapists, physiotherapists, speech therapists, psychologists, ENT Specialists, audiologists and medical doctors were also used to gain additional diagnostic data. Research has shown that a comprehensive, multidisciplinary overview of the child is crucial in determining the overall functioning of a child (Northern & Downs, 2002).

Information pertaining to the hearing impaired participants' medical history was also ascertained from the files and included: the severity of hearing impairment as indicated on individual audiograms; the cause of hearing impairment, if known; the type of amplification used (i.e., hearing aids, bone conductors or cochlear implants); and the existence of any additional co-morbid conditions.

A biographical questionnaire and neurological checklist was administered to the normal sample to gather information about the children's developmental history.

5.5.2. The Revised Extended Griffiths Scales

The Revised Extended Griffiths Scales was administered to all of the participants, namely the hearing impaired and normal sample. As was pointed out in Chapter 4, individual mental ages and sub-quotients for each of the six subscales as well as a total mental age (MA) and general quotient (GQ) are obtained. Based on the sub-quotient score, the performance of the child is interpreted according to the rating system illustrated in the table below.

Table 19: Sub-Quotient categories for the general quotient and the six subscales

	Level of Development						
	Very superior	Superior	Above average	Average	Below average	Far below average	Borderline
GQ	138.9 +	126-138.8	113.1-125.9	87.4-113	64.1-81.9	46.2-64	<46.1
AQ	149.5 +	133.2-149.5	116.8-133.1	84.1-116.7	67.7-84.0	51.3-67.6	<51.2
BQ	149.2 +	132.9-149.1	116.6-132.8	84.1-116.5	67.8-84.0	51.5-67.7	<51.4
CQ	153.5 +	135.6-153.4	117.7-135.5	82-117.6	64.1-81.9	46.2-64	<46.1
DQ	147.6 +	131.9-147.5	116.2-131.8	84.9-116.1	69.2-84.8	53.5-69.1	<53.4
EQ	151.8 +	134.5-151.7	117.2-134.4	82.7-117.1	65.4-82.6	48.1-65.3	<48.0
FQ	152.3 +	134.8-152.2	117.3-134.7	82.4-117.2	64.9-82.3	47.4-64.8	<47.3

The above sub-quotient categories were used when categorising each hearing impaired child's performance on the Revised Griffiths Scales.

5.6. Procedure

In 1994 Prof Luiz was appointed by the ARICD as project director to revise and restandardise the Griffiths Scales. Permission was granted by the Ethics Committee of the University of Port Elizabeth to assess children on the Scales. First children from various cultural groups, who were classified as being normal, were assessed. A further objective of the restandardisation process was to determine the effectiveness of the Griffiths Scales on clinical populations. Targeting a sample of hearing impaired children thus fell under the larger project of revising and restandardising the Scales. Permission was granted by the Ethics Committee of the University of Stellenbosch and Tygerberg Hospital to conduct the study at the Carel du Toit Pre-School. Permission was then granted by the Head of Department of the Ear, Nose and Throat Division of the Tygerberg Hospital, as well as by the Principal of the Carel du Toit Pre-School.

The parents of the hearing impaired children were contacted via the school to inform them of the purpose of the study and what their involvement would entail. Each parent received a consent form, seeking written consent to assess their children and to use the biographical information available at the school (Refer to Appendix E). After the consent forms had been returned, five psychologists-in-training and three intern psychologists from the University of Port Elizabeth conducted the assessment.

The assessment took place under the supervision of two registered users of the Griffiths Scales. The testers had all completed a Users Training Course as prescribed by the ARICD and were also trained on the Revised Scales. The testers adhered strictly to the standardised administration procedures laid down by Ruth Griffiths (1970) and administered the measure in the child's first language. The children were all assessed in designated rooms at the pre-school, thereby minimising any interruptions to the school programme. The school staff set up appointments at times that were convenient for the children, teachers and parents. The assessment took approximately 60 minutes and the parent/ caregiver/child was free to refuse or to withdraw from participating at any stage of the assessment.

The biographical information of each child was collated from the existing data at the pre-school during the week of testing. All data was treated as strictly confidential. The testers scored the protocols, after which they were returned to a registered psychologist at the University of Port Elizabeth for checking. Individual reports on each child were written by the testers and checked by a registered psychologist before being sent to the principal of the school. The parents were free to receive feedback from the principal.

Once all the data had been collected, the capturing and analysis thereof was conducted by a research psychologist.

5.7. Data Analysis

The data was analysed according to the specific aims of the study. Firstly, descriptive statistics were employed to explore and describe the hearing impaired sample's performance on the overall Revised Extended Griffiths Scales as well as on each of the six subscales. Specifically, the mean was used to describe the average of the sample's performance on the assessment measure and gave an indication of the centre of the scores. The standard deviations were used to indicate how the scores were spread around the centre. The range enriched the description of the profile by indicating the difference between the highest and lowest scores.

Frequencies were conducted to summarize the biographical details of the sample according to groups of, for example, age, gender, race, language, socio-economic status and degree of hearing loss as well as according to classification of performance, for example, below average (GQ of 74.5 – 87.3), average (GQ of 87.4 - 113) and above average (GQ of 113.1 – 125.9). This gave an indication of the number of participants that fell into the specified categories mentioned above (Graziano & Raulin, 2000). Using average subquotients, a graphic profile could be presented that depicted the sample's performance on each of the subscales.

Secondly, a matched t-test was conducted to compare the GQ's of the hearing impaired sample with that of the normal sample. The t-test is easily applied and commonly used, and useful when wanting to test the difference between two groups (Graziano & Raulin, 2000). However, with a t-test one can only compare two groups on one variable, which was in this case the GQ. As the GQ is a summary of the six subscales of the Griffiths Scales, and a significant difference was found between the two groups, a post-hoc analysis was conducted to identify on which of the six subscales the discrepancy may have been. The Hotellings T^2-test was employed as it mitigates against making Type I error that usually results from the performance of a number of sequential t-tests on the same data. With the Hotellings T^2-test, the six subscales of the Griffiths Scales could be compared in one analysis, with a p value for each scale. A conclusion could then be drawn as to whether there was a significant difference between the hearing impaired and normal sample on each of the subscales or whether there were only one or two subscales that differed significantly.

Matched t-tests were also conducted to compare the performance of the hearing impaired sample with hearing aids and/or bone conduction as well as those with cochlear implants with the performance of the normal sample. The Hotellings T^2-test was used to determine on which of the six subscales the two samples differed significantly.

5.8. Ethical Considerations

The primary purpose of ethical principles and values is to protect the welfare and rights of research participants and to reflect the basic ethical values of respect for individuals, beneficence and justice (Ethics in Health Research in South Africa, 2000). A brief discussion on the ethical principles upheld throughout the study will follow below.

5.8.1. Respect and Dignity

The primary concern for health research involving human participants should be respect for individuals. Factors to consider include language, culture, customs and perceptions (Ethics in Health Research in South Africa, 2000). Respect was shown to the participants by building factors such as language and culture into the research design. The researcher also avoided exposing the participants to any physical or psychological harm.

5.8.2. Informed Consent

Informed consent is the key to ethical research and implies that a person is informed about the nature of the research, the benefits and risks of the research, and that they are free to withdraw from the research at any stage (Cody, 2001). In the present study informed consent was obtained in writing from the parent’s of the participants before the research was commenced. The parent/caregiver/child were free to withdraw from the research at any point in time.

5.8.3. Privacy and Confidentiality

Most professionals working in the early childhood area are aware of the need to maintain confidentiality about children and their families (Cody, 2001). Out of respect for privacy of the participants, confidentiality was stressed in the consent forms. All data was treated with confidentiality by ensuring that no identifying material was disclosed to anyone who was not authorized by the ethics committee to have access to the data.

5.8.4. Relevance

South African researchers have an ethical and moral responsibility to ensure that their research is relevant both to the country's broad health and developmental needs, as well as to the real needs to those suffering from the disabilities or diseases being studied. The present study's potential contributions have been highlighted in the conclusions cited in Chapter 7.

5.8.5. Scientific Integrity

Besides demonstrating a value and need for the research, the proposed research must also demonstrate thorough methodology and a strong prospect for providing answers to the specific research questions which have been posed (Ethics in Health Research in South Africa, 2000). The present study reflects some of the latest development in the field of hearing impairment, it reflects thorough methodology and has the prospect for providing numerous answers to the development of hearing impaired children.

5.8.6. Inclusion / Exclusion Criteria

It is essential that the recruitment, selection, inclusion and exclusion of research participants in a research study are fair and just, based on ethical and scientific principles. Individuals must not be excluded unjustly or inappropriately based on their age, gender, race, religious beliefs or disability (Ethics in Health Research in South Africa, 2000). All children currently attending the Carel du Toit Pre-School and who met the selection criteria were included in the clinical sample, while all children defined as having a normal development were included in the normal sample of the study.

5.8.7. Transparency

Research investigators are obliged to distribute the research results in a competent and timely manner. However, it is essential that the release of research findings is conducted in an ethical manner, so as to guarantee that false anticipations are not raised in a susceptible public (Ethics in Health

Research in South Africa, 2000). The principal of Carel du Toit Pre-School received a report for each child assessed, summarizing the child's performance on the Revised Griffiths Scales and making suitable recommendations. Reports were also provided to the parents of the children in the normal sample. The results of the study will be written up as a treatise and will be available in the University of Port Elizabeth library, as well as at the Carel du Toit Pre-School. On request, consultation of the results could be discussed with the academic staff of the ENT Department at the Tygerberg Hospital.

5.8.8. Ethical Review

All health research carried out in South Africa must be reviewed by an ethics committee and may only commence once approval has been granted by the committee (Ethics in Health Research in South Africa, 2000). The present study was only commenced once permission had been granted by the UPE and Tygerberg Ethics Committees.

5.9. Chapter Overview

This chapter provided the reader with an overview of the problem formulation and primary aims of this study, together with the research methodology most appropriate to meet the aims of the study. An exploratory descriptive method, together with a between groups comparison, using a variation of a matched groups design, was regarded the most suitable to explore and describe the sample's performance on the Scales of the Griffiths Scales, and then to compare the performance of the hearing impaired sample to that of the normal sample. The data analysis methods were delineated as being descriptive statistics. The results obtained from the data analysis are presented and discussed in the following chapter.

CHAPTER SIX: RESULTS AND DISCUSSION

The empirical findings of the present study will be presented in this chapter in terms of:

i. the hearing impaired sample's overall performance on the Revised Extended Griffiths Scales;
ii. the hearing impaired sample's performance on each subscale of the Revised Extended Griffiths Scales;
iii. a comparison of the performance of hearing impaired children and their counterparts in the normal sample;
iv. a comparison of the performance of the hearing impaired children with amplification and/or bone conduction with the performance of the normal sample; and
v. a comparison of the performance of the hearing impaired children with cochlear implants with the performance of the normal sample.

6.1. Overall Performance of the Hearing Impaired Sample on the Revised Extended Griffiths Scales

The mean General Quotient (GQ) for the hearing impaired sample on the Revised Extended Griffiths Scales is average ($\overline{X}$ GQ = 92.1). Recent studies have revealed that a 'normal' GQ falls in the range of 105 -115 (Knoesen, 2003). The hearing impaired children's mean GQ of 92.1 thus does not fall within this 'normal' range. On general performance (GQ), the minimum score recorded was 43.0 while the maximum score was 127.7 indicating a range of 84.7. Such outlying values, that is, such a low minimum and such a high maximum may have influenced the results. Table 20 provides a summary of the hearing impaired sample's GQ in terms of category breakdown.

Table 20: The General Quotient of the sample in terms of category breakdown

Category	Number of Total Sample	Percentage of Total Sample
Above average	4	6.9%
Average	30	51.7%
Below average	16	27.6%
Far below average	7	12.1%
Borderline	1	1.7%

Overall, the majority of the sample (N = 30) achieved an average GQ on the Revised Extended Griffiths Scales, while 4 children performed above average and 24 fell in the below average to borderline range.

Table 21 indicates the mean developmental sub-quotients for the sample on the Revised Extended Griffiths Scales.

Table 21: Mean developmental sub-quotients for the hearing impaired sample

GRIFFITHS SCALE	MEAN	PERFORMANCE CATEGORISATION	MINIMUM	MAXIMUM	RANGE	SD
GQ	92.1	Average	43.0	127.7	84.7	19.9
AQ	108.8	Average	50.0	160.4	110.4	26.7
BQ	97.2	Average	49.5	147.0	97.5	24.4
CQ	78.0	Below average	17.00	158.2	141.2	33.3
DQ	92.8	Average	37.0	138.0	101	22.7
EQ	93.8	Average	47.6	122	74.4	18.1
FQ	81.5	Below average	31.0	139.9	108.9	27.9

As the table illustrates, results on the Locomotor ($\overline{X}$ AQ = 108.8), Personal-Social ($\overline{X}$ BQ = 97.2), Eye-Hand Co-ordination ($\overline{X}$ DQ = 92.8) and Performance ($\overline{X}$ EQ = 93.8) Subscales reveal average performance. Although the Language Subscale has the largest range (121.2) the remaining subscales also appear to have similarly large ranges, which is probably due to the heterogeneous nature of the hearing impaired sample.

The fact that the highest subquotients were obtained for the Locomotor ($\overline{X}$ AQ = 108.8) and Personal-Social ($\overline{X}$ BQ = 97.2) Subscales can be accounted for by the fact that the two subscales are relatively unrelated to academic performance, they are the least intellectual and focus on gross motor and social independence respectively. Due to the good climate in South Africa, the children are provided with ample opportunities to practice their gross motor skills. Furthermore, at the Carel du Toit Pre-School, the children are provided with situations and time to promote both socialisation and gross motor development which, in turn, could have contributed to the higher scores on these subscales.

The hearing impaired sample performed the poorest on the Hearing and Speech ($\overline{X}$ CQ = 78.0) and Practical Reasoning Subscales ($\overline{X}$ FQ = 81.5). This was expected as a result of the varying degrees of sensory loss present in all the children attending the pre-school and is in accordance with the findings of Griffiths (1984) who assessed 3 hearing impaired children in 3 different case studies. The majority of the children in the sample suffered from profound, permanent hearing losses which impacts on their receptive and expressive language development. Vocabulary and language skills are the basis for conceptual thought, which is assessed on the Practical Reasoning Subscale. Therefore, low scores obtained by these children on the Hearing and Speech Subscale, generally impacted negatively on their performance on the Practical Reasoning Subscale.

In the present study a difference between the highest (AQ=108.8) and lowest (CQ=78.0) developmental subquotients was approximately 31 points. Although this seems to be a large difference, Lister (1981) found that substantial numbers of developmental profiles have been characterised by marked irregularity. Lister (1981) and Luiz (1988d) both found in their respective studies on clinical populations that the differences between the highest and lowest developmental quotients were approximately 16 points or more. Luiz (1988d) found that 32% of the South African children tend to have a difference of 31 - 45 points between their lowest and highest score. The large difference found on the hearing impaired sample therefore needs not be of concern. Table 22 illustrates the difference between the highest and lowest scores for British and South African samples.

Table 22: Differences between the highest and lowest scores for the British and South African samples studied by Lister (1981) and Luiz (1988d) respectively, expressed as percentage

Sample	**Differences between the highest and lowest scores, expressed as a percentage**						
	1–15	16-30	31–45	46–60	61–75	76-70	91-105
British %			14	16	10	0	9
South African %			32	17	5	1	0

Figure 21 is a graphically presented profile, depicting the performance of the hearing impaired sample on each of the six subscales, using the average subquotients.

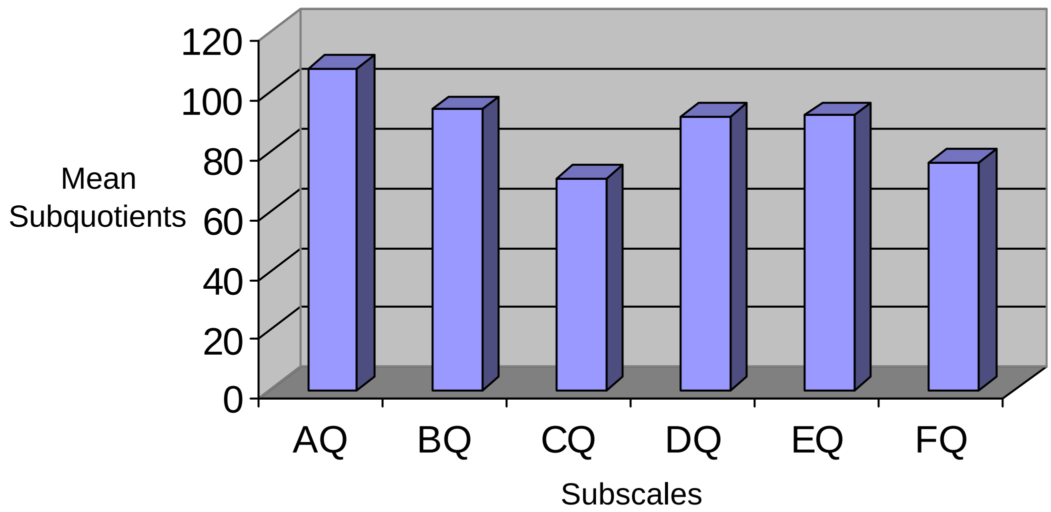


Figure 21: Griffith's developmental profile of hearing impaired children in years 4 to 8 on the Revised Extended Griffiths Scales

As was previously mention in Chapter 4, Griffiths (1984) and Luiz (1988a) conducted case studies on hearing impaired children. When comparing figures 12, 13 and 21 it is evident that the profile of the hearing impaired children established on the Revised Extended Griffiths Scales is very similar to the one established on the original Griffiths Scales.

6.2. Performance of the Hearing Impaired Sample on each of the Six Subscales of the Revised Extended Griffiths Scales

6.2.1. Performance of the Hearing Impaired Sample on the Locomotor Subscale (AQ)

Descriptive data indicated that the mean quotient for the sample on this subscale was 108.8, reflecting average performance. The minimum score recorded was 50.0, while the maximum score was 160.4 resulting in a range of 110.4. A standard deviation of 26.7 was identified.

Table 23 provides a summary of the sample's performance on the Locomotor Subscale in terms of category breakdown.

Table 23: Performance of the hearing impaired sample on the Locomotor Subscale in terms of category breakdown

Category	Number of Total Sample	Percentage of Total Sample
Very superior	3	5.2%
Superior	10	17.2%
Above average	12	20.7%
Average	23	39.6%
Below average	2	3.6%
Far below average	7	12.1%
Borderline	1	1.6%

The results indicate that the majority (82.7%) of the sample appear to be rather well developed in terms of completing locomotor activities. Only 17.3% of the sample seemed to have limitations or difficulties in this area. The low scores obtained can be related to co-morbid conditions such as cerebral palsy or autism. Furthermore, factors such as parenting styles and opportunities for play may also have lead to differences in motor development (Ittyerah & Renu, 1997). Overprotection may, for example, limit the child's opportunity to explore its environment. Hearing loss is also often syndromic in nature and is only one of a number of conditions caused by a single disease, hence a child may present as both hearing impaired and cerebral palsied.

6.2.2. Performance of the Hearing Impaired Sample on the Personal-Social Subscale (BQ)

On the Personal-Social Subscale, the mean quotient was 97.2, indicating average performance. The minimum score recorded was 49.5 while the maximum score was 147.0, signifying a range of 97.5. The results point to a standard deviation of 24.4. Table 24 provides a summary of the sample's performance on the Personal-Social Subscale in terms of category breakdown.

Table 24: Performance of the hearing impaired sample on the Personal-Social Subscale in terms of category breakdown

Category	Number of Total Sample	Percentage of Total Sample
Superior	7	12.1%
Above average	5	8.6%
Average	23	39.7%
Below average	8	13.8%
Far below average	14	24.1%
Borderline	1	1.7%

The majority of the sample (60.4%) fell within the average to superior range, indicating that most children were independent in personal-social tasks. The good performance of most children may be related to the pre-school's emphasis on socialisation and experiential learning. Social activities are employed to teach language, while the free playtime allows for spontaneous interaction among the children. The 39.6% of the sample that fell within the below average to borderline categories may be due to emotional problems such as overprotection, frustration and withdrawn behaviours. The child in the borderline range has been diagnosed with a hearing impairment and autism, which is characterised by marked abnormal development in social interaction and communication and restricted repertoire of activities and interests (Kaplan & Sadock, 1998). Some hearing impaired children may also pick up clues concerning social behaviour visually, and may therefore misinterpret what is being observed and thus respond in a socially inappropriate manner, or not at all. Due to their limited verbal abilities, hearing impaired children's interaction with normal peers may also be limited outside the school environment, limiting their opportunities to practice these skills.

6.2.3. Performance of the Hearing Impaired Sample on the Hearing and Speech Subscale (CQ)

Descriptive data reflects that the mean quotient for the Hearing and Speech Subscale was 78.0, which falls within the below average category. The minimum score recorded was 17.00, while the maximum was 158.2, thus presenting a range of 141.2. The results signify a standard deviation of 33.3. The table below reflects the sample's performance on the Hearing and Speech Subscale in terms of the category breakdown.

Table 25: Performance of the hearing impaired sample on the Hearing and Speech Subscale in terms of category breakdown

Category	Number of Total Sample	Percentage of Total Sample
Very superior	1	1.7%
Above average	2	3.5%
Average	20	34.5%
Below average	8	13.8%
Far below average	14	24.1%
Borderline	8	13.8%
Cognitively impaired	5	8.6%

60.3% of the sample fell within the below average to cognitively impaired range, while the minority (39.7%) of the sample fell within the average to very superior category. The low scores are as a direct result of the sensory deficit the children suffer from and correlate with the profiles of previous case studies of hearing impaired children. The subscale requires comprehension of language and specific verbal expressive skills and research has shown that learning to communicate is one of the greatest challenges that hearing impaired children face (Marschark, 1993).

The large range of 141.2 found on this subscale, indicates that the hearing impaired children varied greatly in terms of their hearing and speech development. This variation may be related to factors such as the degree of hearing loss the children suffer from, the intervention received, the degree of parental involvement and whether the child suffers from any co-morbid disorders such as learning disabilities or general cognitive impairment.

6.2.4. Performance of the Hearing Impaired Sample on the Eye and Hand Co-ordination Subscale (DQ)

The mean quotient on the Eye and Hand Co-ordination Subscale was 92.8 indicating average performance. The minimum score recorded was 37.0, the maximum score was 138.0, the range was 101 and the standard deviation was 22.7. The table below presents the sample's performance on the Hand and Eye Co-ordination Subscale in terms of the category breakdown.

Table 26: Performance of the hearing impaired sample on the Eye and Hand Co-ordination Subscale in terms of category breakdown

Category	Number of Total Sample	Percentage of Total Sample
Superior	5	8.6%
Above average	3	5.2%
Average	34	58.6%
Below average	7	12.1%
Far below average	8	13.8%
Borderline	1	1.7%

72.4% of the sample performed in the average to superior range on this subscale, which indicates that the majority of the sample appear to be on par with their chronological development with regard to their visual-motor ability. The good performance may be related to the fact that the majority of the children receive intensive intervention from a multiplicity of professionals such as occupational therapists and physiotherapists. 27.6% of the children tested illustrated possible developmental delay in this area, falling within the below average to borderline ranges. Research has revealed that co-morbid disorders such as attention deficit disorder, hyperactivity, neurological immaturity and brain damage as well as eye problems may be related to specific neurodevelopmental delays in perceptual motor functioning, which in turn may have impacted the performance of some hearing impaired children on this subscale (Ittyerah & Renu, 1997).

6.2.5. Performance of the Hearing Impaired Sample on the Performance Subscale (EQ)

Descriptive statistics revealed that the mean quotient for the Performance Subscale was 93.8 which reflects average performance. The minimum score was 47.6 while the maximum score was 122.0, the range was 74.4 and the standard deviation was 18.1. The table below reflects the sample's performance on the Performance Subscale in terms of the category breakdown.

Table 27: Performance of the hearing impaired sample on the Performance Subscale in terms of category breakdown

Category	Number of Total Sample	Percentage of Total Sample
Above average	5	8.6%
Average	36	62.1%
Below average	13	22.4%
Far below average	3	5.2%
Borderline	1	1.7%

70.7% of the sample performed average to above average on this subscale, which indicates that the majority of the sample appear to be advanced in their visual-spatial ability. Only 29.3% illustrated possible developmental delay in this area by falling within the below average to borderline range. Since many of the items on this subscale are timed, the performance of some children may have been influenced by co-morbid conditions such as eye problems, slow cognitive functioning, cerebral palsy, autism and ADD/ADHD. Furthermore, in a hearing impaired class of 5 to 10 children, functioning to any time limit is not a priority and there is a possibility that internalised time frames do not exist in the children. The children are used to having instructions repeated and complete tasks in their own time.

6.2.6. Performance of the Hearing Impaired Sample on the Practical Reasoning Subscale (FQ)

The mean quotient for the Practical Reasoning Subscale was 81.5 indicating below average performance. The minimum score was 31.0 while the maximum score was 139.9, signifying a range of 108.9. The standard deviation was 27.9.

The table below presents the sample's performance on the Practical Reasoning Subscale in terms of the category breakdown.

Table 28: Performance of the hearing impaired sample on the Practical Reasoning Scales in terms of category breakdown

Category	Number of Total Sample	Percentage of Total Sample
Superior	2	3.5%
Above average	4	6.9%
Average	16	27.6%
Below average	16	27.6%
Far below average	10	17.2%
Borderline	10	17.2%

37.9% of the sample performed average to superior on this subscale, which indicates that the minority of the sample appear to be on par with their chronological age with regard to their higher order cognitive functioning. 62.1% illustrated possible developmental delay in this area by falling within the below average to borderline range. Vocabulary and language skills are the basis for conceptual thought which is necessary for success in mainstream schooling and is assessed on this subscale. Due to the majority of the sample's underdevelopment in terms of vocabulary and language skills, the majority of the sample also performed lower than what is expected for their age in terms of their conceptual thought. The items on this subscale depend to a large extent on questions and answers, and gestures or demonstrations are not used for all questions, which could have made understanding difficult. A number of hearing impaired children may also have experienced difficulties in responding to all the questions, which will have impacted on their performance on this subscale. Furthermore, overall slow development could also have contributed to low scores on the subscale.

6.3. Comparison of the Performance of the Hearing Impaired Sample to the Normal Sample

According to the matched samples t-test, a significant difference exists between the performance of the hearing impaired and normal sample [t = 80, (-4.71), p<0.001]. The normal sample had a mean GQ of 113.9 (standard deviation of 12.9) while the hearing impaired's mean GQ was 96.7 (standard deviation of 19.6). Figure 22 provides an illustration of the developmental profiles of the two samples.

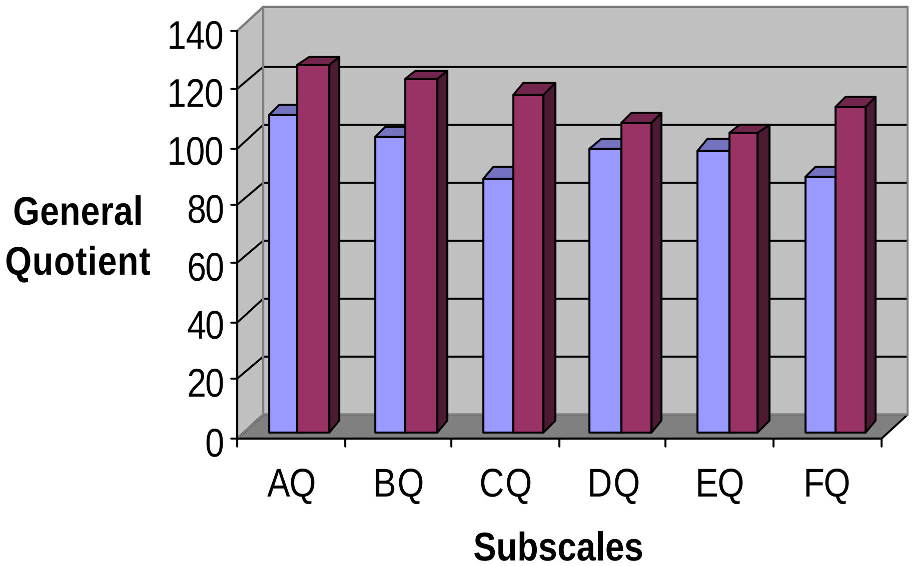
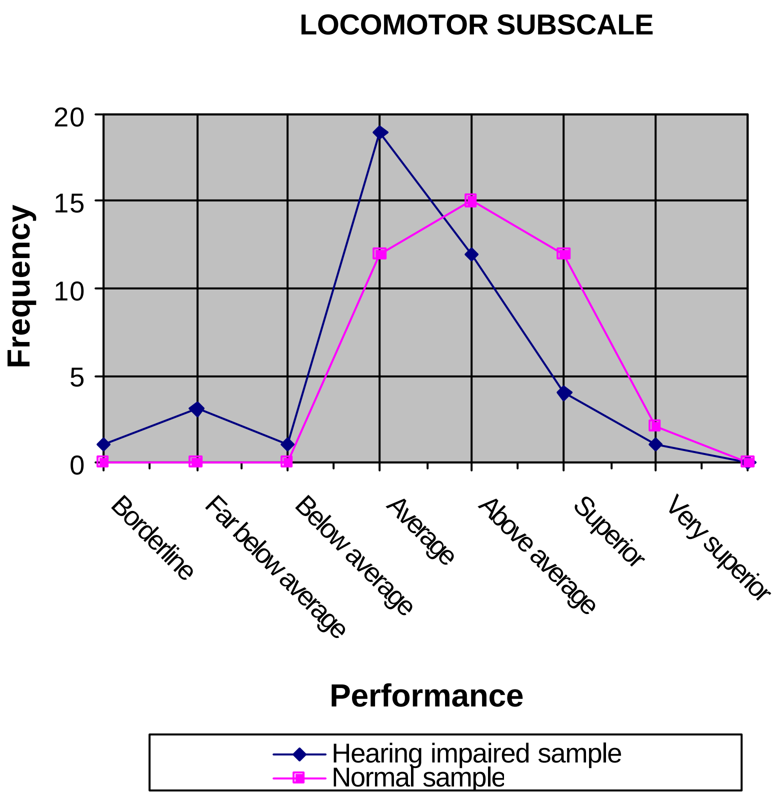


Figure 22: The developmental profiles of the hearing impaired and normal sample

The profiles depicted in the figure above illustrate the importance of examining all aspects of the learning processes in order to understand the difficulties that hearing impaired children may experience. Even though most of the results of the hearing impaired children are average or near average, some of the children may have been unable to perform adequately as they had difficulty hearing and/or understanding instructions. Some of the children were, however, able to compensate for their hearing deficit and used visual cues to assist their understanding of questions.

Results of the Hotellings T^2-test, indicated that a significant difference exists between the performance of the hearing impaired and normal sample on four of the six subscales, namely, the Locomotor (AQ), Personal-Social (BQ), Hearing and Speech (CQ) and Practical Reasoning (FQ) Subscales. A discussion will now follow on the comparison of the two samples on each of the six subscales.



Key:

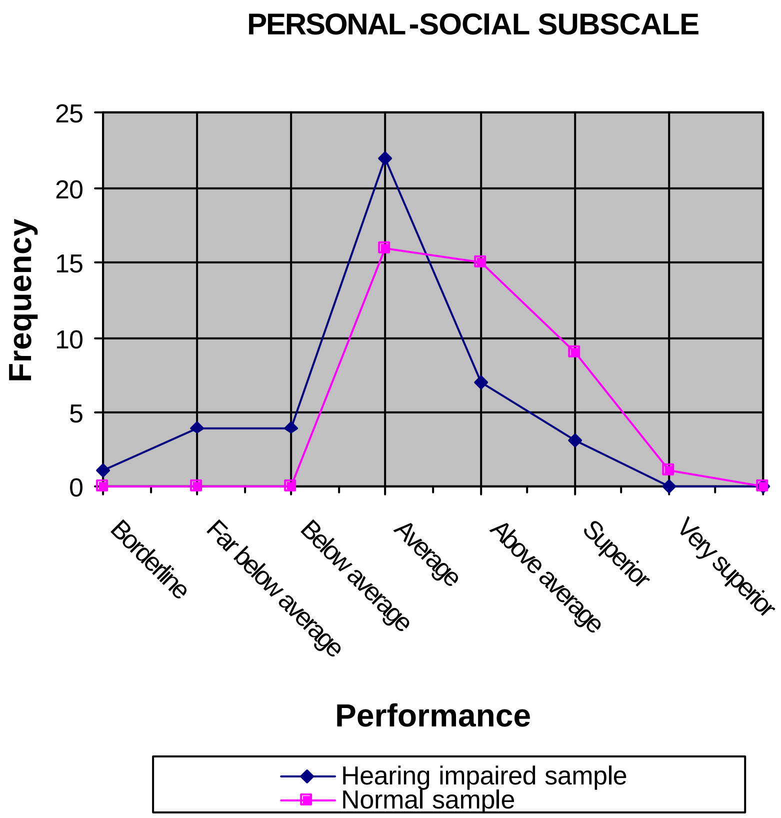
Hearing impaired sample:	Mean = 109.0	Standard Deviation = 24.4
Normal sample:	Mean = 126.0	Standard Deviation = 16.7

Figure 23: A comparison of the hearing impaired and normal sample on the Locomotor Subscale (N=41)

As can be seen in Figure 23, the normal sample performed significantly better than the hearing impaired sample on the Locomotor Subscale [t = 80, (-3.68), p<0.001]. Research has shown contradictory findings with regards to the locomotor development of hearing impaired children when compared to normal children. For example, according to Trawick-Smith (2000) vision and hearing often affect motor ability. However, findings by Dummer et al. (1996) reveal that hearing impaired children show a typical sequence of motor skill acquisition, similar to that of hearing children.

Although a significant difference was found between the locomotor skills of the normal and hearing impaired sample in this study, 36 of the hearing impaired children fell within the average to superior range. Only 5 children performed below average. The hearing impaired sample's general good performance may be related to the fact that the children are in a normal developmental stage of exploration and activity. In addition, the pre-school has a well equipped outdoor play area and opportunities are provided to utilise this area before, during and after a school day. Hearing impaired children may also use motoric activities to compensate for distress resulting from constant concentration pertaining to listening and speaking. Therefore, despite the significant difference between the two samples, the hearing impaired sample performed within the average range on this subscale.

According to the Hotellings T^2-test, the normal sample also performed significantly better than the hearing impaired sample on the Personal-Social Subscale [t = 80, (-4.49), p<0.001]. The graph below illustrates the performance of the two samples.



Key:

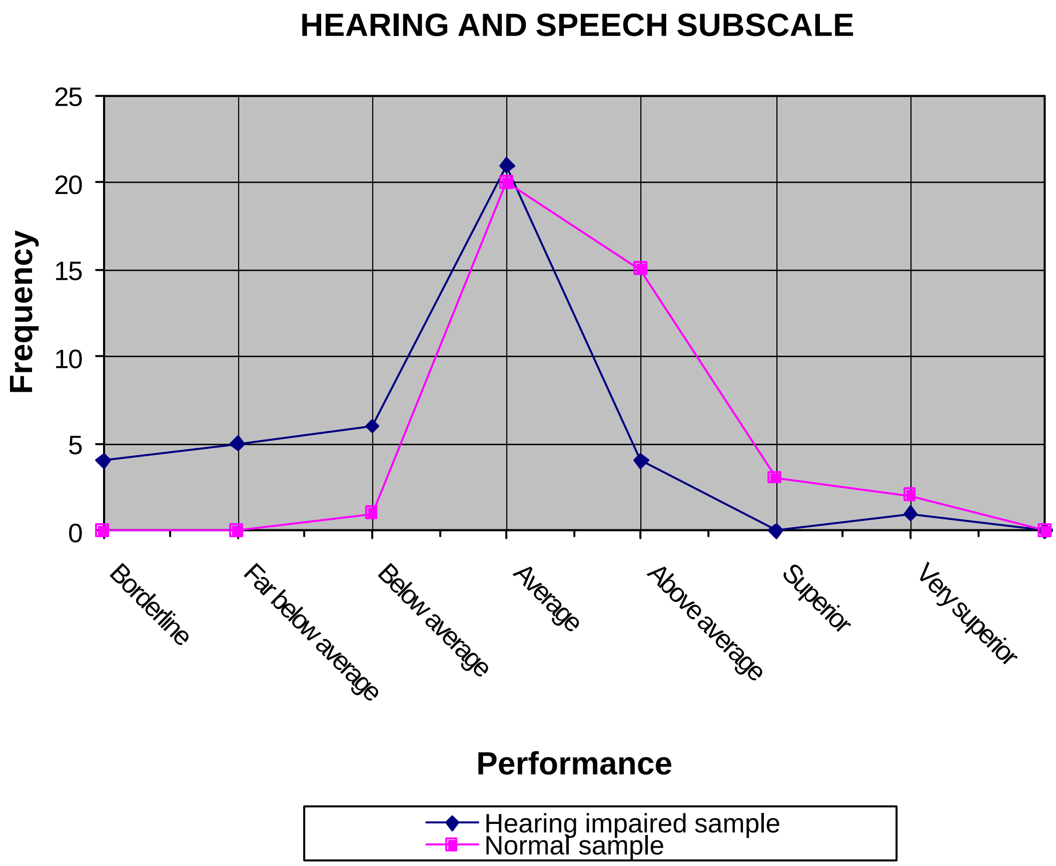
Hearing impaired sample:	Mean = 101.4	Standard Deviation = 23.0
Normal sample:	Mean = 121.4	Standard Deviation = 16.7

Figure 24: A comparison of the hearing impaired and normal sample on the Personal-Social Subscale (N=41)

Scheetz (2001) noted a difference in the emotional development of hearing impaired children when compared to normal children, stating that hearing impaired may be more restricted at Erikson's (1965) *initiative* versus *guilt* stage of emotional development due to their parent's control and overprotection.

Despite the significant difference found between the performance of the hearing impaired and normal sample on this subscale, the majority of the hearing impaired children seemed to have developed adequately in terms of their personal-social skills. Of the 41 matched children, 32 of the hearing impaired children fell in the average to very superior range, while only 9 performed below average to borderline. The good performance may be attributed to the fact that the Carel du Toit Pre-School uses all daily activities which include socialisation to teach and consolidate vocabulary and language skills. The hearing impaired children are in an environment where the parent guidance programme empowers the parents to guide and support their children's personal-social development, while the pre-school promotes socialisation through their outings and experiential learning. The hearing impaired children thus receive intensive stimulation in this area. The high degree of involvement by many parents may also contribute to the children's healthy interactions (Luterman, 1999).

When comparing the two samples on the Hearing and Speech Subscale, the normal sample performed significantly better than the hearing impaired sample [t = 80, (-5.04), p< 0.001]. Great differences of opinion exist regarding the language potential of hearing impaired children. While some argue that hearing impaired children have the same cognitive ability to learn language as children with hearing, others argue that even a mild hearing loss can interfere with the normal development of speech and language because the child has difficulty in learning higher order concepts (Schirmer, 2001; Serbetcioglu, 2001). The graph below illustrates the performance of the two samples on the Hearing and Speech Subscale.



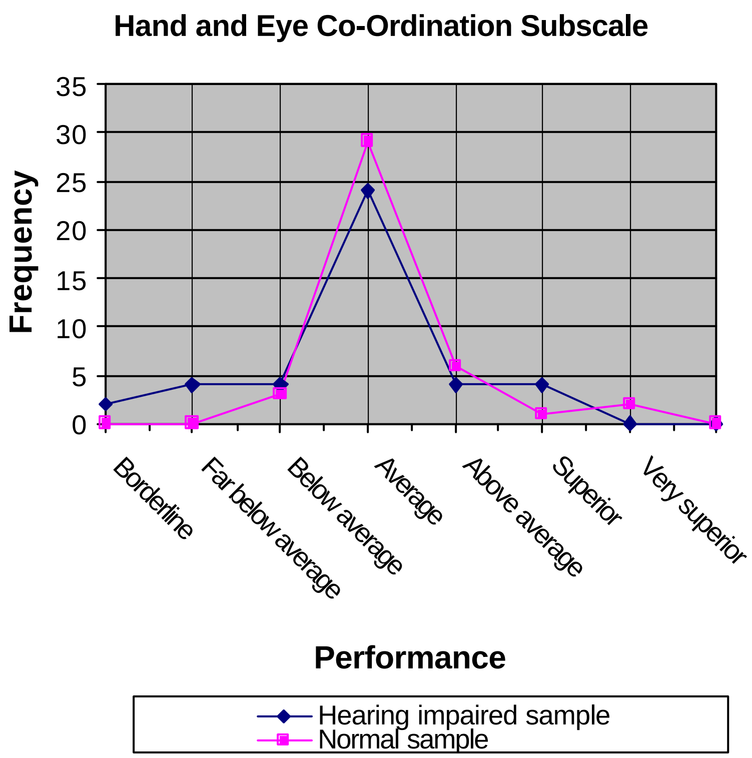
Key:

Hearing impaired sample:	Mean = 87.3	Standard Deviation = 30.8
Normal sample:	Mean = 116.2	Standard Deviation = 19.8

Figure 25: A comparison of the hearing impaired and normal sample on the Hearing and Speech Subscale (N=41)

Most of the hearing impaired children in the sample suffered from a severe to profound hearing loss which may be the direct cause of the limited hearing and language skills the children present with. Despite their sensory deficit, 26 of the 41 hearing impaired children fell in the average to very superior range, with 15 falling in the below average to borderline range. The low scores of some children may be attributed to factors such as delayed diagnosis and intervention, difficulties with amplification and the presence of co-morbid disorders. Those children fitted with cochlear implants are taught language later than other hearing impaired children as cochlear implants can only be fitted after the age of 18 months. This delay may therefore have an effect on the development of a number of children assessed in the study.

Results from the present study revealed no significant difference between the performance of the hearing impaired and normal sample on the Hand and Eye Co-ordination Subscale [t = 80, (-2.0), p>0.05]. The graph below illustrates the performance of the two samples on the subscale.



Key:

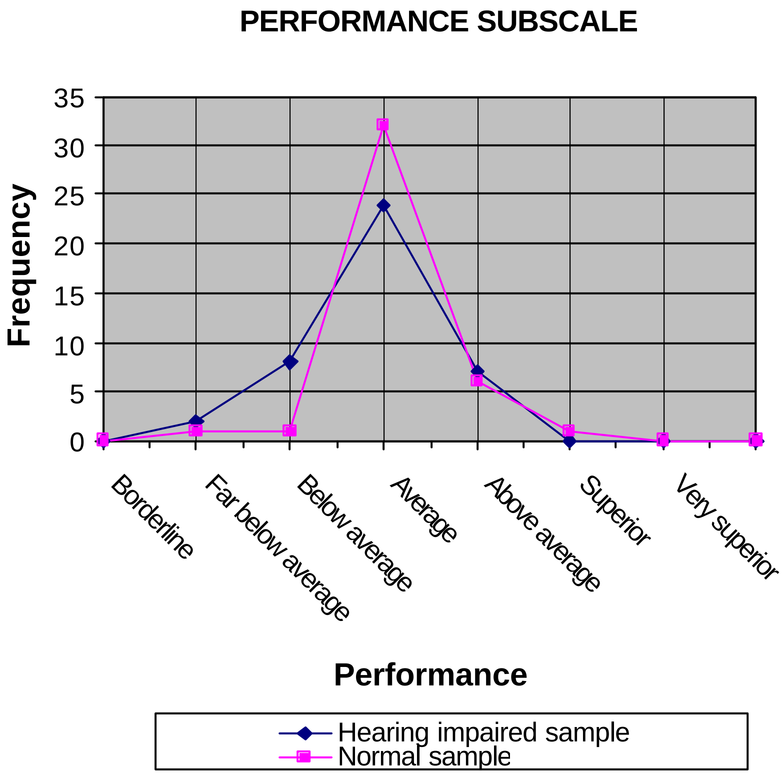
Hearing impaired sample: Mean = 97.3 Standard Deviation = 23.1

Normal sample: Mean = 106.2 Standard Deviation = 17.1

Figure 26: A comparison of the hearing impaired and normal sample on the Hand and Eye Co-ordination Subscale (N=41)

Results indicate that 32 of the hearing impaired children fell in the average to superior range, compared to the 38 normal children, while only 10 hearing impaired children performed below average to borderline. The slight difference between the performance of the two samples may be attributed to the fact that some hearing impaired children suffered from co-morbid disorders such as eye problems, neurological immaturities or general slow developmental progress, especially in areas of visual-motor and visual-spatial abilities. Programmes at the pre-school, however, provide opportunities to practice visual motor skills and professional assistance in the form of occupational therapy provides the required remediation.

No significant difference was found on the performance of the two samples on the Performance Subscale [$t = 80$, (-1.51), $p > 0.005$]. Results show that 31 of the hearing impaired children performed above average to superior on this subscale with 10 hearing impaired children falling in the below average to borderline range. The differing performance of the two samples may result from the fact that many of the items on this subscale are timed. Furthermore, some children may experience problems with concentration and low tasks tolerance which in turn may result in poor performance on this subscale. Research has also shown that hearing impaired children may be clumsier in handling objects which may have partially affected the children's perceptual motor co-ordination (Ittyerah & Renu, 1997). The graph below illustrates the performance of the two samples on the subscale.

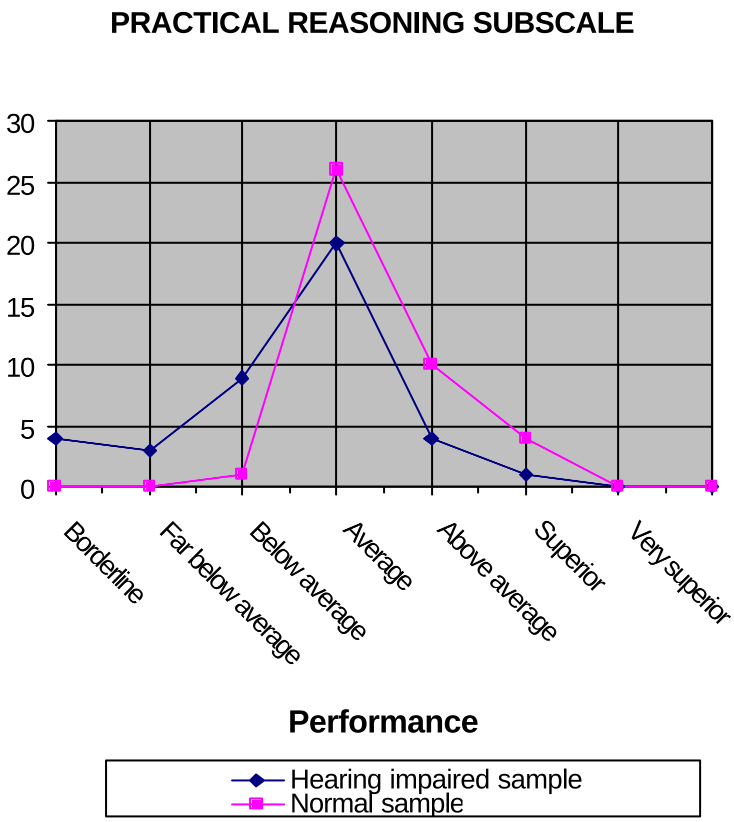


Key:

Hearing impaired sample:	Mean = 97.0	Standard Deviation = 18.1
Normal sample:	Mean = 102.8	Standard Deviation = 16.3

Figure 27: A comparison of the hearing impaired and normal sample on the Performance Subscale (N=41)

The normal sample performed significantly better than the hearing impaired sample on the Practical Reasoning Subscale [t = 80, (-5.09), p<0.001]. The graph below illustrates the performance of the two samples on the subscale.



<u>Key:</u>

Hearing impaired sample:	Mean = 87.5	Standard Deviation = 26.0
Normal sample:	Mean = 111.7	Standard Deviation = 15.7

Figure 28: <u>A comparison of the hearing impaired and normal sample on the Practical Reasoning Subscale (N=41)</u>

Results indicate that 25 of the hearing impaired children fell in the average to superior range, compared to the 40 normal children that performed in the average and above average ranges. The significant difference in performance may be attributed to the fact that this subscale has a high correlation to speech and language skills and skills necessary for formal learning. As a result of the sensory deficit, such children develop slower with regard to their language and speech which in turn impacts on their higher order skills and concept formation which are more abstract in nature and assessed on this subscale.

6.4. Comparison of the Performance of the Hearing Impaired Sample with Amplification and/or Bone Conduction to the Performance of the Normal Sample (N = 27)

According to the matched t-test, the normal sample performed significantly better on the Revised Griffiths Scales when compared to the hearing impaired children with amplification and/or bone conduction [t = 52 (-3.37), p< 0.05]. Results highlighted that 20 of the hearing impaired children with amplification and/or bone conduction, compared to the 27 normal children, fell in the average and above range. Therefore, despite the significant difference between the performances of the two samples, the majority of the hearing impaired children performed favourably.

As can be seen in the table below, the significant difference was again found on four of the six subscales, namely, the Locomotor (AQ), Personal-Social (BQ), Hearing and Speech (CQ) and Practical Reasoning (FQ) Subscales.

Table 29: Comparing the performance of the hearing impaired children with amplification and/or bone conduction with the performance of the normal sample (N=27)

	Mean 1	Mean 2	t-value	df	p-value	SD	SD
AQ	111.7	126.7	-2.9	52	0.005**	19.3	18.0
BQ	102.5	122.0	-3.6	52	0.000***	22.7	16.2
CQ	93.8	116.7	-3.3	52	0.002**	30.0	20.1
DQ	96.6	105.6	-1.8	52	0.083	19.4	17.8
EQ	98.3	102.9	-1.0	52	0.312	17.6	15.6
FQ	92.4	110.5	-3.1	52	0.003**	26.6	15.3

Key: Mean 1 = Hearing impaired sample with amplification and/or bone conduction

Mean 2 = Normal sample

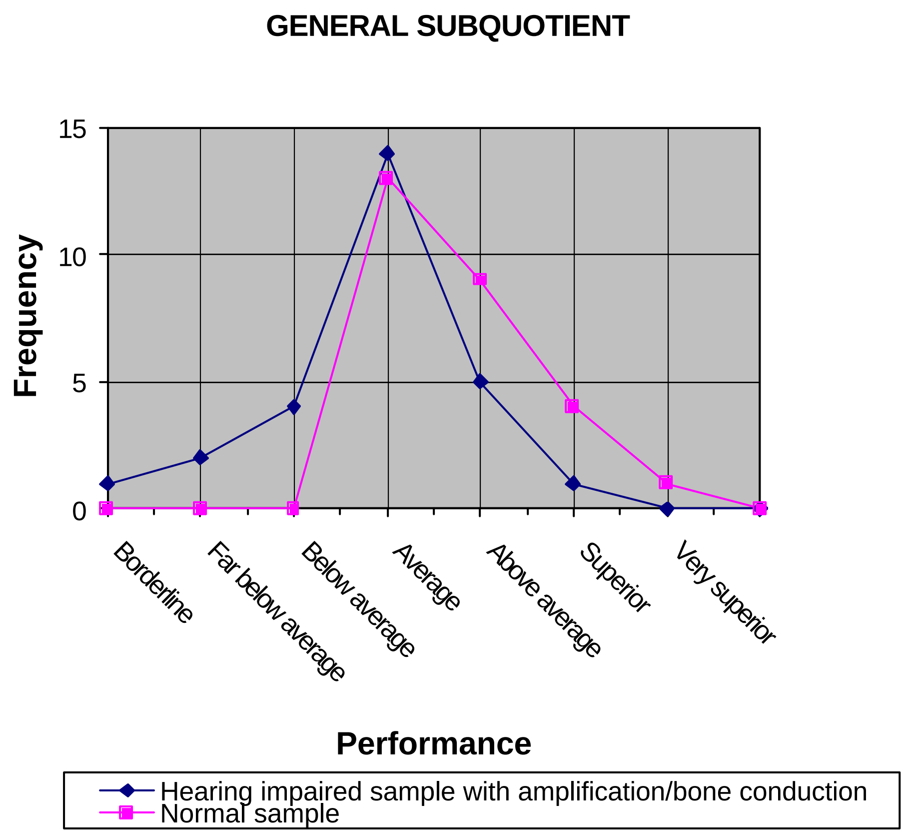
df = Degrees of freedom

SD = Standard deviation

** = Significant at p < 0.05

*** = Significant at p < 0.001

The figure below provides an illustration of the general quotients for each sample.



Key:

Hearing impaired sample: Mean = 99.4 Standard Deviation = 18.5

Normal sample: Mean = 113.9 Standard Deviation = 12.

Figure 29: A comparison of the general quotients of the heari ng impaiired children with amplification and/or bone conduction and the normal sample (N=27)

6.5. Comparison of the Performance of the Hearing Impaired Sample with Cochlear Implants to the Normal Sample (N = 15)

According to the matched t-test, the normal sample performed significantly better on the Revised Griffiths Scales when compared to the hearing impaired children with cochlear implants [t = 28 (-3.44), p< 0.05]. 10

of the 15 hearing impaired children fitted with cochlear implants fell in the average to superior range. The children therefore seem to be developing at a rate compatible to their age.

As can be seen in the Table below, the significant difference was again found on four of the six subscales, namely, the Locomotor (AQ), Personal-Social (BQ), Hearing and Speech (CQ) and Practical Reasoning (FQ) Subscales.

Table 30:Comparing the performance of the hearing impaired children with amplification and/or bone condauction with the performance of the normal sample (N=15)

	Mean 1	Mean 2	t-value	df	p-value	SD	SD
AQ	102.5	122.5	-2.2	28	0.037**	31.4	16.4
BQ	97.7	120.5	-2.9	28	0.006**	24.5	17.4
CQ	72.1	115.6	-4.7	28	0.000***	30.1	19.3
DQ	96.7	108.3	-1.3	28	0.191	29.6	16.0
EQ	94.1	102.3	-1.2	28	0.228	18.8	17.7
FQ	76.2	113.4	-5.1	28	0.000***	23.3	16.2

Key: Mean 1 = Hearing impaired sample with cochlear implants

Mean 2 = Normal sample

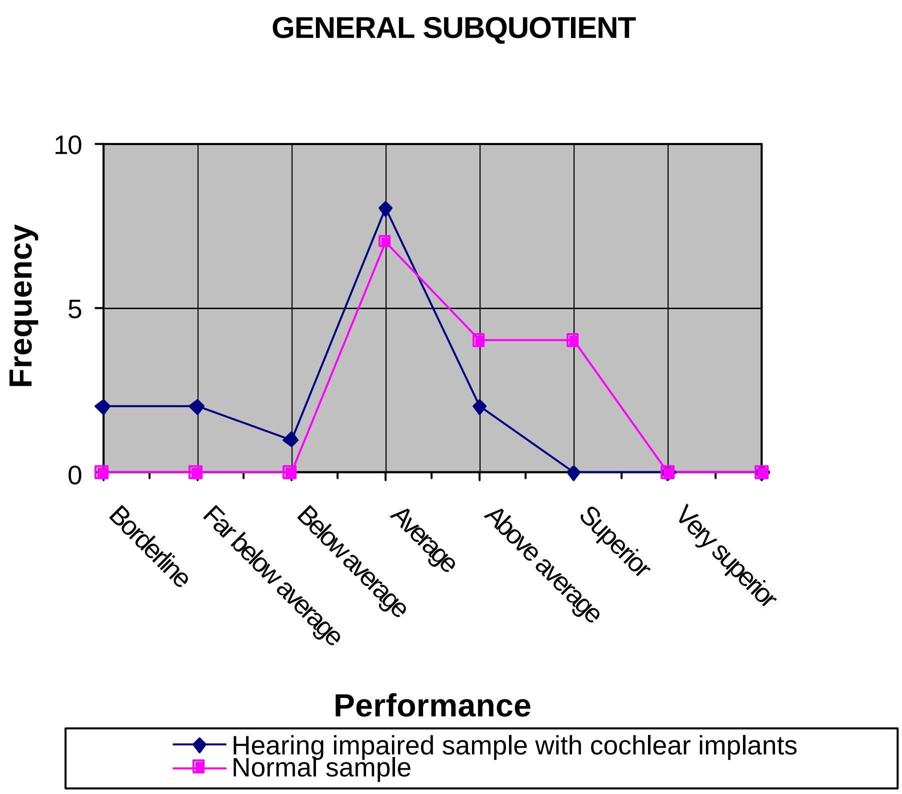
df = Degrees of freedom

SD = Standard deviation

** = Significant at $p < 0.05$

*** = Significant at $p < 0.001$

The figure below provides an illustration of the general quotients for each sample.



Key:

Hearing impaired sample: Mean = 92.2 Standard Deviation = 20.7

Normal sample: Mean = 114.0 Standard Deviation = 13.4

Figure 30: A comparison of the general quotients of the hearing impaired children with cochlear implants and the normal sample (N=15)

The performance of hearing impaired children with cochlear implants is similar to the overall developmental profile established for the hearing impaired sample.

In summary, the findings illustrated that the mean quotient for the hearing impaired sample on the Revised Extended Griffiths Scales was average. The children performed average on the Locomotor, Personal-Social, Hand and Eye Co-Ordination and Performance Subscales, while performing below average on the Hearing and Speech and Practical Reasoning

Subscales. Furthermore, a significant difference was found between the performance of the hearing impaired and normal sample on the four subscales mentioned above.

6.6. Chapter Overview

This chapter provided the reader with an overview of the primary and secondary aims of the study, together with the findings and discussion thereof. The reader was provided with a developmental profile for hearing impaired children as established on the Revised Extended Griffiths Scales. Comparisons were made between the performance of the hearing impaired and normal sample and significant differences were highlighted. Conclusions, limitations and recommendations will follow in the next chapter.

CHAPTER SEVEN: LIMITATIONS, RECOMMENDATIONS AND CONCLUSIONS

7.1. Introduction

With the revision and restandardisation of the Griffiths Scales, one objective was to identify the usefulness of the Revised Extended Griffiths Scales on different clinical populations. The present study therefore focused on the performance of a sample of hearing impaired children, residing in the Western Cape, South Africa. Although the sample represents a heterogeneous group of children, there are some central issues such as language delay that affect most hearing impaired children and their overall development.

7.2. Limitations

Methodological issues such as the experimental design, the sampling procedure, and uncontrolled variables limit generalisations from this study. The following limitations need to be acknowledged:

7.2.1. Limitations of the Research Approach

In achieving the primary objective of the present study, the research design was exploratory in nature and hence the research approach employed was descriptive. As mentioned previously, when using this design, the researcher lacks full control over the extraneous variables in the study and consequently no cause-and effect conclusions can be drawn. Hence findings of the study can only be confidently generalized to the hearing impaired children presently attending the Carel du Toit Pre-School.

7.2.2. Limitations Regarding the Sampling Procedure

A non-probability, purposive sampling method was applied to identify suitable children to be tested. Due to the fact that the probability that an individual will be selected is not known, the researcher cannot claim that the sample is representative of the larger population. This will limit the ability to generalise the research findings beyond the specific sample being studied. However, a non-probability sample may prove to be adequate if the researcher does not intend to generalise the findings beyond the study's sample, or if the study is merely a trial run for a larger study (Bailey, 1987), as is the case in the present study.

Hearing impaired children are a heterogeneous group and variables such as the type and severity of the hearing loss, the type of amplification and the intervention received could impinge on a hearing impaired child's development and could account for possible developmental delays in certain children. Since all these factors could not be controlled for in the present study, they need to be acknowledged as limitations to the present study.

The hearing impaired sample in the present study was drawn from a pre-school geared specifically for hearing impaired children, which caters for their individual needs within a multidisciplinary approach and uses an oral method to teach language. Hearing impaired children who do not have the luxury of this support system may show different developmental patterns, due to the lack of stimulation in certain risk areas. However, case studies conducted by Griffiths (1984) and Luiz (1988a) on hearing impaired children produced profiles similar to the one obtained from the sample assessed in this study, thus underpinning the results obtained from the present research.

The fact that only children residing in urban areas in around Cape Town were included in the hearing impaired sample, may be a limiting factor as there is evidence that urban children perform better than rural children on certain cognitive skills (Kendell, Verster & van Mollendorf, 1998). This variable could thus be responsible for differing profiles among hearing impaired children.

As only children between the ages of 36 and 95 months were included in the present study, the ability to generalize the findings to children of older and younger age ranges must be done with caution, and with a developmental perspective in mind.

The number of pre-schoolers falling in the Black and Asian cultural group was small when compared to the other cultures assessed. Although this factor could limit the generalisability of the findings, Allan (1992) found in her study that there were no significant differences between the cultural groups with respect to the General Quotient, Personal-Social and Practical Reasoning Subscales on the Griffiths Scales. With respect to the other four subscales, Coloured and Black children performed similarly, as did White and Asian children. The only subscale on which White children performed significantly better, was on the Hearing and Speech Subscale.

7.2.3. Limitations Regarding the Lack of South African Norms for the Revised Griffiths Scales

As mentioned in Chapter 4, norms for South African children are not currently available for the Revised Extended Griffiths Scales and hence the results should be interpreted with caution. However, as a result of the many research projects that have utilised this measure on both normal and clinical populations (e.g. Allan, 1992; Kotras, 2001; Knoesen, 2003), the results can confidently be used for diagnostic purposes.

7.2.4. Limitations Regarding the Lack of South African Research Conducted on Hearing Impaired Children Profiling their General Development

As mentioned previously, to date no South African research has been conducted on a selected group of hearing impaired children to profile their general development. Linking the findings of the present study to other related research in South Africa is therefore limited. However, when linking the findings of the present study to the previous case studies conducted on hearing impaired children, similar trends are found. The children with a hearing loss perform the lowest on the Hearing and Speech and Practical Reasoning Subscales, which lean heavily on the ability to use language to develop conceptual thought processes.

In spite of the limitations, the findings of the present study made valuable contributions to research on hearing impaired children. The extent to which the findings of the present study can be generalised still needs to be verified by further research. Preliminary findings indicate that patterns of development, which seem relatively characteristic of children with a hearing loss, have been identified.

7.3. Recommendations for Future Research

Although the researcher acknowledges the foregoing limitations of this study, it is suggested, however, that the findings have important implications for future research. These include the following:

1. the need to conduct not only a static, cross-sectional study, but a longitudinal investigation to determine whether there is a transient hastening in the rate of maturation of the hearing impaired children or whether their development continues to lag behind their hearing peers;
2. a comparative study could be performed at other South African pre-schools that cater for hearing impaired children and use oral versus total communication as means of teaching language;
3. the necessity to employ, together with the assessment measure, other qualitative information in the form of case studies to complement the quantitative data, and in this manner provide a more integrated picture of the hearing impaired children;
4. more systematic research is necessary to establish the effect of variables such as age of diagnosis, degree of hearing loss, levels of intervention and type of amplification on the development of hearing impaired children;
5. to investigate whether early identification enables hearing impaired children to be enrolled into mainstream education, and to explore what variables are necessary for this transition to take place;
6. the findings of the present study be disseminated as broadly as possible to assist with therapeutic programmes and to allow for early intervention and appropriate stimulation in all areas of

concern, especially in areas of South Africa where no specialised schooling is available.

The study also has important implications for the Carel du Toit Pre-School. It is important that the school remains as a specialised unit in order to provide guidance to parents and multidisciplinary intervention to the children affected by a hearing loss. Furthermore, the school ought to continue to be a resource and training centre for parents, teachers and students throughout South Africa. With the emphasis on inclusive education, it is suggested that therapeutic programmes, based on the results of the study, be developed at pre-school level to focus on the specific developmental weaknesses and strengths of the children so as to ultimately allow for successful mainstreaming.

7.4. Conclusions

Focusing on a clinical population, namely, hearing impaired children, has furthered the process of revising and restandardising the Griffiths Scales of Mental Development. The study highlighted that the Revised Extended Griffiths Scales can be successfully used in evaluating the developmental profiles of hearing impaired children. The value of the measure, with regard to the assessment of hearing impaired children, was emphasised by the fact that the developmental profiles established on the Revised Extended Griffiths Scales, are similar to the developmental profiles obtained when single case studies were conducted on the original Griffiths Scales.

Overall, this study contributes to South African research focusing on hearing impaired children using an oral method of communication, and more specifically to the current state of child health in our country. The study provides professionals such as paediatricians and psychologists with a developmental profile of hearing impaired children. Using the results, in-patient and home programmes can thus be devised to assist with language and cognitive development. The results can also serve as a valuable guide to professionals who are involved with teaching and caring for hearing impaired children by providing information on the general development of these children. Provision of appropriate services depends on thorough knowledge of the individuals to be assisted.

This study has emphasised the impact that a hearing loss can have on the development of a child. The goal for all children with a hearing loss should be early detection followed by appropriate intervention. The development of language is the foundation for all other aspects of human behaviour, growth and development. It is not unusual for hearing impaired children to feel isolated in a hearing world and Davis (1988) hypothesised that much of the social isolation comes from the fact that they are so similar to children with normal hearing and yet they are so different. Davis (1988) states:

> "They misunderstand, they are inconsistent in their responses, they sound different when they speak, and they make 'dumb mistakes' in class. They are just unusual enough to call attention to themselves, but not different enough to elicit concern, pity or empathy" (p.410).

Through the findings of this study, hearing impaired children can receive appropriate intervention to assist them in achieving their optimum personal development.

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APPENDIX A

Extended Scale Items that need to be Modified or Replaced

Scale A Items	**Item Description**	**M/R**	**Scale D Items**	**Item Description**	**M/R**
AIV 3	Marches in time.	M (A)	DV 6	Scissors.	M (A)
AV 1	Can run to kick a ball.	R	DVI 1	Threads 12 beads.	M
AV 4	Jumps a 6in. high rope.	M	DVI 4	Make 3 + letters.	M
AV 5	Can climb on/off bus.	M	DVI 5	Write first name.	M
AV 14	Can hopskip.	M (A)	DVII 5	Can write figures to 9.	M
AV 16	Hopscotch I.	M (A)			
AVII 1	Jumps a 10in. high rope.	M			
AVII 3	Hopscotch II.	M (A)			
AVII 4	Can run with steady gait	M (S)			
AVII 6	Hopscotch III.	M (A)			
Scale B Items	**Item Description**	**M/R**	**Scale E Items**	**Item Description**	**M/R**
BIV 5	Helps to lay table.	M	EIII4, III6, V1, VIII2	Six hole board.	M (T)
BV 3	Uses knife and fork.	M	EIII5, IV4, VII3	Four square board.	M (T)
BV 5	Can fasten shoes.	M	EIV1, VI5, VIII4	Returns 9 bricks.	M (T)
BVI 3	Can go alone.	R	EIV6, VI1, VII4	Eleven hole board.	M (T)
BVI 4	Can go alone.	R	EV3, V5, VII5, VIII5	Pattern making 2.	M (T)
BVI 5	Can brush and comb hair.	M	EVI4, VII1, VII6, VIII6	Pattern making 3.	M (T)
			EV6, VI2, VIII3, EXTRA	Pattern making 5.	M (T)
			EVI6, VII2, VIII1, EXTRA	Pattern making 4.	M (T)
Scale C Items	**Item Description**	**M/R**	**Scale F Items**	**Item Description**	**M/R**
CVII 3	Knows 20+ capitals.	M	FV 1	Knows 2 coins.	R
CVII 4	Similarities 1.	M	FV 4	Knows 3 coins.	R
CVII 5	Differences 2.	M	FV 5	Which goes faster?	M
CVII 6	Capital letters.	M	FV 12	Knows 4 coins.	R
			FV 13	Knows 5 coins.	R
			FVII 1	Counts to 30.	M
			FVII 2	Knows right & left.	M
			FVII 4	Can say the days.	M
			FVII 5	Tells the time.	M

Key: M = Modify. R = Replace. A= Administration. S = Scoring. T= Time limit.

APPENDIX B

Pilot Testing Phase III: New and Modified Items for Scales A and B

SCALE A			SCALE B		
Old	**New Item**	**Key**	**Old**	**New Item**	**Key**
III 2	Can stand on one foot for 3+ seconds.	M	IV 5	Helps with small household chores.	N
IV 3	Can jump over 6in. hurdle.	N	V 1	Washes own hands and face with some assistance.	N
V 1	Can run and kick a medium size ball (2 trials).	N	V 3	Cleans own teeth.	M
V 4	Bunny hops 3+.	M	V 5	Can fasten shoe buckles (Test).	M
V 5	Broad jump 15in. (37,5cm).	M			
VI 4	Can hopskip recognisable.	N	V 6	Manages top coat unaided or jersey unaided.	M
VI 6	Hopscotch 1 block (2 trials).	N			
VII 1	Can jump 10in. vertical hurdle.	M	VI 3	Can fetch item in shop by request.	N
VII 2	Marches in time to tambourine	M			
VII 3	Hopsctoch 2 blocks (2 trials).	N	VI 4	Chooses own clothes.	N
VII 4	Can run, with a steady pace, all around plaground.	M	VII 2	Can get a drink of water from a tap.	N
VII 6	Static balance 20+ seconds.	M	VII 4	Can eat without assistance.	N
VIII4	Hopscotch 3 trials (2 trials).	M	VII 5	Wash and dry own hands.	N
VIII7	Hopskips some distance in an open area.	M	VIII3	Takes full responsibility for tidiness of hair. See manual for description.	M
			VIII4	Baths and showers without assistance.	M

Key: N = New. M = Modified.

APPENDIX C

Pilot Testing Phase III: New and Modified Items for Scales C and D

SCALE C			SCALE D		
Old	**New Item**	**Key**	**Old**	**New Item**	**Key**
IV 3	Uses 2+ personal pronouns. Examples in the manual.	S	III 1	Draws a horizontal stroke in imitation.	S
IV 4	Comprehension 2+ items. Examples & scoring in the manual.	S	III 5	Copies circle – Stage I	S
			III 6	Copies a cross – Stage I	S
			IV 5	Copies a 'ladder' Stage I	S
VI 2	Comprehension 4+. Examples in the manual.	S	IV 6	Draws a 'man' – Stage I.	S
			V 1	Copies a cross – Stage II.	S
VI 3	Uses 6+ descriptive words. Examples in the manual.	S	V 2	Copies a circle – Stage II.	S
			V 3	Draws a square – Stage I.	S
VI 5	Uses 6+ personal pronouns. Examples in the manual.	S	V 4	Window – Stage I.	S
			V 5	House –Stage I.	S
VIII 2	Similarities – two.	N	V 6	Scissors: Can strip edge of paper neatly (must cut between the line & the edge).	M
VIII 3	Comprehension – six. Examples & scoring in the manual.	S			
VIII 4	Differences – three.	N	VI 2	Triangle – Stage I.	S
VIII 5	Similarities – three.	N	VI 3	Draws man – Stage II.	S
VIII 6	Opposites – three.	N	VI 4	Copies 6+ letters.	M
VIII 7	Differences – five.	N	VI 5	Copies f the 9 letters.	M
			VI 6	Draws a house – Stage II.	S
			VII 1	Copies a square – Stage II.	S
			VII 2	Ladder – Stage II.	S
			VII 3	Draws diamond – Stage II.	S
			VII 4	Draws triangle – Stage II.	M
			VII 6	Makes 10+ letters.	M
			VIII 1	Window – Stage II.	M
			VIII 2	Draws a man – Stage III.	M
			VIII 3	Diamond – Stage II.	M
			VIII 4	Copies 9 figures.	M
			VIII 5	Can write full name.	M
			VIII 6	Makes 24+ letters.	M
			VIII 7	House – Stage III.	S

Key: N = New. M = Modified. S = Scoring (More examples given. Instructions made clearer).

APPENDIX D

Pilot Testing Phase III: New and Modified Items for Scales E and F

SCALE C

Old	New Item	Key
III 2	Return 9 bricks to box and replaces lid within 60 seconds (2 trials).	M
III 3	Four-squares board: 65 seconds (2 trials).	T
III 5	Four-squares board: 45 seconds (2 trials).	T
IV 1	Returns 9 bricks to box and replaces lid within 40 seconds (2 trials).	M
IV 4	Four-squares board: 20 seconds (2 trials).	T
IV 6	Eleven-hole board: 80 seconds (2 trials).	T
V 1	Six-hole board: 25 seconds (2 trials).	T
V 6	Pattern making No.5: 70 seconds.	T
VII 1	Pattern making No.3: 45 seconds.	T
VII 2	Pattern making No.4: 45 seconds.	T
VII 4	Eleven-hole board: 35 seconds (2 trials).	T
VII 6	Pattern making No.3: 35 seconds.	T
VIII 2	Six-hole board: 15 seconds (2 trials).	T
VIII 3	Pattern making No.5: 30 seconds.	T
VIII 4	Returns 9 bricks to box & lid within 15 seconds (2 trials).	M
VIII 6	Pattern making No.3: 30 seconds.	T
VIII 8	Pattern making No.5: 20 seconds.	T

SCALE D

Old	New Item	Key
III 1	Repeats one digit – 8; 2; 7. (Give practice example. 1 of 3 = pass).	M
III 3	Repeats 2 digits – 16; 53; 94. (Give practice example. 1 of 3 = pass).	M
III 5	Ask: “Is it right or wrong to hurt someone?” and “Is it right or wrong to lie to someone?” (1 of 2 = pass).	N
IV 4	Counts 4 bricks correctly. (The child must touch the bricks).	M
IV 5	“Which costs more?” : “A bicycle or a ball?” (practice) #1 “Ice-cream or a watch?”	N
V 1	Repeats 4 digits – 5816; 3729; 4952. (Give practice example. 1 of 3 = pass).	M
V 2	Can count 10 bricks. (The child must touch the bricks).	M
V 4	Visual memory (3 of 5 = pass).	N
V 5	“Which goes faster?” : “A big dog running or a baby (puppy) dog running?”	N
V 6	Can count 15 bricks (The child must touch the bricks).	M
VI 3	“Which sots more?” : “ A bicycle of a ball?” (practice) #2 “Cool-drink or shoes?”	N
VI 4	Abstraction: “Take out the middle block.”	
VII 2	Knows “right” and “left” (6+)	N
VII 3	Can count backwards from 10.	M
VII 4	Can say 6 of the 7 days of the week.	M
VII 5	Picture Arrangement: Kick the ball (practice). #1 Bird’s nest	N
VIII 1	Days of the week: questions (2+) “What day comes after Tuesday?” “What day comes before Saturday?” “What day comes after Sunday?” (2 of 3 = pass).	M

			VIII 2	Picture Arrangement: Kick the ball (practice) #2 Glass of water	N
			VIII 5	Can count backwards from 20 (tester starts counting to demonstrate).	M
			VIII 6	Series: Practice + 1.	N
			VIII 7	Directional arrows (4 of 4 = pass).	N
			VIII 8	Picture Arrangement: Kick the ball (practice) #3 Build a house	N

Key: N = New. M = Modified. T = New time.

APPENDIX 9

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APPENDIX E

Exploring the Developmental Profiles of hearing impaired pre-school children using the Revised Griffiths Scales.

Dear Parent/Caregiver Date:

RE:................................(Child's name)........................(Date of birth)

The University of Port Elizabeth (UPR0 in corroboration with the Carel du Toit Pre-school plans to conduct a research project exploring the developmental profile of hearing impaired children, using the Revised Extended Griffiths Scales of Mental Development (GSMD). This study was evaluated and approved by the ethics committee of Stellenbosch University. The Griffiths Scales were developed in Britain in the 1960's and are used internationally for the developmental assessment of young children. A research team under the leadership of Prof. D. M. Luiz, Department of Psychology, UPE, is currently revising the Scales at the request of the Association for Research in Infant and Child Development in London, England.

Despite South Africa being a country where a significant number of infants and children are hearing impaired, to date, limited research has been conducted on profiling their general development. For this reason it is necessary to accumulate knowledge about their cognitive, psychological and personal-social growth so as to assist with future placement. Furthermore, from the findings of the study, information pertaining to your child's development will be made available. From this, individual therapeutic programmes can be developed so as to allow for appropriate stimulation in any areas of concern.

We are writing to ask for your permission to allow your child (named above) to take part in this research project, which involves an assessment on the Griffiths Scales. During the assessment, which takes approximately one hour, children are asked to complete a number of age appropriate tasks, such as building bricks, throwing a ball, drawing and naming pictures. The assessment will take place at the school during the period 24-28 June 2002 at a time which the teachers have allocated to us, and will not interfere with your child's education. Furthermore, there will be no personal costs involved and following the assessment, the principal of your school will receive a written report regarding your child's performance. The assessment results will be used for research purposes and all information will be treated as strictly confidential. If you are agreeable for your child to take part in this project, we would be grateful if you could complete the enclosed consent form and return it to the addressed envelope as soon as possible. If you wish to obtain further information about this project please contact us at the telephone numbers provided below. If you do not wish your child to take part in this project, please indicate this on he consent form and you will not be contacted again. Furthermore there would be no prejudice against children whose parents refuse to participate in this study.

We would like to stress that the success of this project depends on your consent and we sincerely thank you in anticipation.

Yours sincerely

Prof. D. M. Luiz
Tel : 041-5042354
Department of Psychology (UPE)
Supervisor

Dr. J. M. Jansen
Tel: 041-3731227
Department of Psychology (UPE)
Co-supervisor

I. Schröder
Intern psychologist

UPE

University of Port Elizabeth
Universiteit van Port Elizabeth
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CONSENT FORM

Please complete the relevant sections

Child's Full name: ....

Child's Date of Birth: ....

Gender: Male / Female

Name and Address of parent(s) / guardian

....

....

....

....

....

....

Telephone: ....

PLEASE COMPLETE SECTION A OR B

Section A

1. I confirm that I have read and understand the information letter regarding the Griffiths Scales Research Project.
2. I understand that my child's participation in this project is voluntary and I may choose to withdraw him / her at any time, without giving any reason.
3. I agree that my child is assessed and participates in this research project.

4. Participation in this study will not result in any additional costs to you.

Parent/ Guardian signature: ………………………….. Date: ……………

Section B

1. I do not agree for my child to participate in this research project.

Parent/ Guardian signature: ………………………….. Date: ……………

Please return this Consent Form in the addressed envelope.

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'n Ondersoek van die Ontwikkelingsprofiele van gehoorgestremde voorskoolse kinders met behulp van die Hersiene en Uitgebreide Griffithsskale vir Verstandsontwikkeling.

Geagte Ouer / Versorger

RE: ....(Naam van kind) .... (Geboortedatum)

Die Universiteit van Port Elizabeth (UPE), in samewerking met die Carel du Toit Voorskoolse Sentrum beplan 'n navorsingsprojek wat die ontwikkelingsprofiel van gehoorgestremde kinders sal ondersoek met behulp van die Hersiene en Uitgebreide Griffithsskale vir Verstandsontwikkeling. Hierdie studie is geëvalueer en goedgekeur deur die Etiese Komitee van die Universiteit van Stellenbosch.

Die Griffithsskale is gedurende die sestigerjare in Brittanje ontwikkel en word internasionaal gebruik om die ontwikkeling van jong kinders te evalueer. 'n Navorsingspan onder leiding van Prof. D. M. Luiz van die Department Psigologie van UPE is tans besig om hierdie skale te hersien op versoek van die *Association for Research in Infant and Child Development*, wat in Londen, Engeland gesetel is.

Alhoewel daar 'n beduidende aantal gehoorgestremde suigelinge en kinders in Suid-Afrika is, is daar weinig navorsing op hierdie gedoen met die oog op die daarstelling van 'n profiel van hulle algemene ontwikkeling. Hierdie leemte noodsaak die versameling van kennis oor hulle kognitiewe-, psigologiese-, en persoonlik-sosiale groei om die korrekte skoolplasing moontlik te maak.

Voorts sal inligting oor u kind wat uit die ondersoek voortspruit aan u beskikbaar gestel word. Op grond daarvan sal individuele terapeutiese programme ontwikkel kan word wat gemik is op die stimulering van areas waar tekorte aangetoon is.

Deur middel van hierdie skrywe vra ons toestemming dat u kind, wie se naam bo-aan hierdie dokument verskyn, mag deelneem aan hierdie navorsingsprojek. Dit sal 'n evaluering met behulp van die Griffithsskale behels en sal omtrent 'n uur in beslag neem. Al wat u kind hoef te doen, is om 'n aantal ouderdomsverwante take te verrig, soos blokkiesbou, bal gooi, sowel as die teken en benoeming van prente.

Die evaluering sal by die skool plaasvind tussen 24-28 Junie 2002 op 'n tydstip wat deur die leerkragte goedgekeur word. Die evaluering sal geensins inbreuk maak op u kind se onderrig nie. Daar sal geen vergoeding van u verwag word nie, en 'n geskrewe verslag oor u kind se prestasie sal na afloop van die navorsing aan die skoolhoof voorsien word. Alle resultate sal slegs vir navorsingsdoeleindes gebruik word en alle inligting sal streng vertroulik behandel word.

Indien u gewillig is dat u kind deelneem aan hierdie projek, sal ons dit waardeer as u die ingeslote toestemmingsvorm voltooi en so spoedig moontlik in die geadresseerde koevert terugstuur. Vir enige verdere inligting omtrent hierdie projek kan u ons kontak by die telefoonnommers wat hieronder verskyn. Sou u verkies dat u kind nie aan hierdie projek deelneem nie, moet u die asseblief op die toestemmingsvorm aandui, in welke geval u nie weer geraadpleeg sal word nie. Kinders wie se ouers deelname aan die studie weier, sal op geen manier benadeel word nie.

Ons wil dit benadruk dat die sukses van hierdie projek afhang van u toestemming, en ons wil u by voorbaat opreg daarvoor bedank.

Die uwe

Prof D.M. Luiz
Tel : 041-5042354
Departement Psigologie (UPE)
Studieleier

Dr. J. M. Jansen
Tel: 041-3731227
Departement Psigologie (UPE)
Co-studieleier

I.Schröder
Intern Sielkundige

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TOESTEMMINGSVORM

Voltooi asseblief die toepaslike afdelings

Volle name van kind: ....

Geboortedatum van kind: ....

Geslag: Manlik / Vroulik

Naam en adres van ouer(s) / voog

....

....

....

....

....

....

Telefoon: ....

VOLTOOI ASSEBLIEF AFDELING A OF AFDELING B

Afdeling A

1. Ek verklaar dat ek die inligtingsbrief rakende die Griffithsskale Navorsingsprojek gelees het en die inhoud daarvan verstaan.
2. Ek begryp dat my kind vrywillig aan hierdie projek deelneem en dat ek te enige tyd kan besluit om hom/haar daarvan te onttrek sonder die opgawe van redes.
3. Ek verleen toestemming dat my kind psigometries evalueer word en mag deelneem aan hierdie navorsingsprojek.

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1600, PORT ELIZABETH, 6000, SOUTH AFRICA. ☎ +27 41 5042111 +27 41 5042574.

4. Ek sal nie enige vergoeding verlang vir my kind se deelname aan die projek nie.

Handtekening (Ouer /Voog): ………………………….. Datum: ……………

Afdeling B

1. Ek verleen nie toestemming dat my kind aan hierdie navorsingsprojek mag deelneem nie.

Handtekening (Ouer /Voog): ………………………….. Datum: ……………

Stuur asseblief hierdie toestemmingsvorm terug in die geadresseerde koevert.