EXPLORING THE DEVELOPMENTAL PROFILE OF BLACK HIV POSITIVE/AIDS INFANTS AND CHILDREN: A LONGITUDINAL STUDY

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This treatise is dedicated to the memory of my father
Peter Alexander David Sandison
And all you loved and dreamed for me

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ABSTRACT

This study aimed at exploring the developmental profile of HIV positive/AIDS infants and children (three to 35 months) over a period of 11 months in the Nelson Mandela Metropole, utilising the Revised Extended Griffiths Scales of Mental Development (GSMD). The purpose was to generate information about the development of HIV positive/AIDS infants and children, highlighting developmental strengths and weaknesses to ultimately aid the custodians of these children with their interventions. A non-probability purposive sampling method was applied, and a longitudinal profile was generated as participants were assessed twice. Participants were all outpatients at Kwazakhele Day Clinic, Dora Nginza and Livingstone Hospitals in the Nelson Mandela Metropole, and were located for the study through their caregiver's attendance of an HIV support groups at the Dora Nginza Hospital. Data was analysed statistically using descriptive statistics and Hotelings-T^2 tests. Results indicated a significant difference between first and second assessment on the General Quotient and on two of the six subscales, namely Eye-Hand Co-ordination (D) and Practical Reasoning (F). It was deduced that development declined or did not improve as participants aged.

Key words: HIV/AIDS, SES, development, GSMD

Chapter 1
INTRODUCTION

1.1 Introduction

Chapter 1 conceptualises the present research study, which concerns the development of infants and young children with HIV/AIDS as measured by the Revised Extended Griffiths Scales of Mental Development (GSMD). A range of theoretical avenues are examined to contextualise the study. HIV/AIDS is investigated along with various components relating to the disease, such as its history and effects to date. The developmental path of young children is surveyed, along with the effect of that development in the presence of HIV/AIDS, as well as the effect of low socio-economic status (SES) on child development. Thereafter the focus moves to assessment, and the dynamics involved in developmentally assessing children, including the use of appropriate tools to do so, with the GSMD verified as such a tool. The research problem and aims are then stated, as well as an outline of the chapters guiding the study.

1.2 HIV/AIDS

The Human Immunodeficiency Virus (HIV) is a retrovirus found within the tissue fluids of the body. It impairs the body's natural defence mechanisms through the destruction and/or functional impairment of CD4 cells that are pivotal to the immune reaction. Thus, immunity declines and the body gradually becomes more vulnerable to attack, resulting in the proliferation of more and more opportunistic infections and malignancies, until immunosuppression and thus AIDS results. Presently there is no cure for this disease.

Within South Africa (SA) there is an infection rate of approximately 20%, with new infections being increasingly concentrated in younger age groups. As the number of infections and deaths increase, the effect on the macro- and micro levels of society becomes more evident, for example in the

economy, and health care, and in the transformation in the structure of society.

Infants and young children infected with HIV usually acquire the disease from their mothers pre- or post natally. There is a 30% probability of a mother transmitting the disease on to her unborn infant (Whiteside & Sunter, 2000). As it has been found that nine out of 10 HIV-positive women in developing countries are unaware that they are infected (Foundation for Professional Development, 2003), mothers are often unaware of their child's HIV status, until illnesses commence and medical attention is needed.

HIV may cause a wide spectrum of disease as the infant's immune system develops still in the first year of life, and is particularly vulnerable to the effects of HIV early on. HIV may render abnormalities from birth, or may take a time before presenting with developmental compromise. Through central nervous system (CNS) involvement there is a failure to attain, or loss of developmental milestones that can broadly be divided into two areas, that of cognitive and motor delays. Daily living skills of children are also impacted and as such, dysfunction may manifest in a deterioration of play, or loss of previously acquired language and socially adaptive skills (Belman, 1992). As developmental compromise is very individual, a comprehensive developmental assessment is fundamental to determining the effect of HIV/AIDS on development, and thus to the identification of particular strengths and weaknesses for each individual child.

1.3 Child Development and Assessment

Children progress through orderly developmental sequences, consisting of changes and continuities that are progressive. Various factors affect the way in which children advance through these sequences, including culture, environmental conditions and even disease, which may serve to delay or speed up the developmental process. As indicated, infants and children who are HIV positive or have AIDS often show developmental delays or deficits, and thus they veer from the usual developmental path. Lower SES further

complicates development, and thus, for example, may lead to children functioning below their intellectual potential (Houston-McMillan, 1997).

Development itself may be divided into domains, that of physical and motor, cognitive, and socio-emotional development. To measure the well-being of a child each of these domains should be assessed (Brooks-Gunn, 1990). “Each aspect of development influences and is influenced by the others” (Edwards, 1992, p. 9). Thus, a problem in one area may effect the functioning of the others, and hence a deficit may influence the child entirely. These developmental domains are hence interdependent, and aid the conceptualisation and understanding of a child’s development.

The developmental assessment of infants and young children has been widely acknowledged as vital to the identification of developmental delays, and examines functioning in each of the developmental areas. To optimise the child’s development, intervention should occur as early as possible. Early detection of a delay facilitates early intervention to improve problem areas before they intensify.

To reach this ideal it is vitally important that the assessment measures used are chosen carefully, ensuring that they are valid and reliable. Regardless of efforts made to meet this need, there are many limitations to the assessment measures that are currently used with young children. The Griffiths Scales is a widely used measure of child development, and is one of the few developmental tests that does not only focus on one area of development, but examines across all the various areas, namely, physical and motor, cognitive, and social-emotional.

1.4 Griffiths Scales of Mental Development

The Griffiths Scales of Mental Development is an assessment measure that looks at the development of infants and young children, examining development broadly by focusing on physical and motor, cognitive, and socio-emotional development. It may be sub-divided into the Revised Infant Scales (IS), used with children from birth to two years of age, which also

forms part of the Revised Extended Griffiths Scales of Mental Development (GSMD), used with children from birth to eight years of age. The GSMD is reported to be one of the few tests that can be applied to children below the age of three (Bhamjee, 1991).

The GSMD graphically quantifies the developmental profile and thereby illustrates the individual child's relative abilities and disabilities based on the domains tapped by each subscale. Its clinical usefulness as a diagnostic measure has been proven and continues to grow in the assessment and identification children with special needs (Luiz, 1994).

The test was developed in Britain based on the observation of children in their natural environments, and consequently is described as a "play" test, as it contains items that are fun as they originate from activities rooted in natural conduct such as walking and talking (Houston-McMillan, 1997). This characteristic is particularly appealing within South Africa's multicultural context as the test taps experiences common to different cultures. It may thus be considered to be potentially culture-fair.

Research utilising the GSMD indicates that the measure has acceptable levels of reliability, and is a stable measure of development (Alridge Smith, Bidder, Gardner & Grey, 1980; Hanson, 1982; Honzik, McFarlane & Allan, 1966). Examples of international research locations include Canada (Ramsay & Fitzharding, 1977), China (Collins, Jupp, Maberly, Morris & Eastman, 1987), and also in Australia, Greece, Lebenon, the United States of America (USA).

The GSMD were introduced to SA in 1977, and have been adapted for use here. South African based research regarding its clinical use has shown the scales to be effective in clinical assessment and diagnosis of children from both clinical and normal population groups (e.g. Heimes, 1983; Lombard, 1989. Mothuloe, 1990; Stewart, 1997; Tukulu, 1996). Research that focuses on the technical properties of the GSMD has shown it to be a reliable and valid measuring instrument (e.g. Beail, 1985; Griffiths, 1984; 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 (Allan, 1998; 1992; Bhamjee, 1991).

It is evident that extensive research has been conducted in support of the GSMD, conclusively proving its worth as an assessment measure. However, recent research highlighted areas that needed revision, indicating that items and norms were outdated, and some of the items were culturally biased and ambiguous. Thus, in March of 1994 a project was initiated to revise the GSMD, and the new measure, the Griffiths Mental Development Scales – Extended Revised (GMDS-ER) was launched in May 2004. Although the GMDS-ER was standardised on a British population, it has been used in SA, and research which examines its various technical aspects, as well as proving its usefulness on clinical populations, is ongoing.

1.5 South African Context in which the Research is Based

SA is a multicultural society, constituted of a range of languages and ethnic groups that makes the population extremely diverse. In its not too distant history, SA implemented the policy of apartheid that lead to discriminatory practices, which manifested in unequal services provided to the various cultural groupings. Resources were disproportionately distributed, with areas classified as belonging to the Black population receiving considerably less government funding, manpower and other resources, when compared with other groups. This unfair distribution was evident in the general lack of institutions, such as crèche's and clinics, and facilities such as roads and housing to which Black individuals were allowed access.

The apartheid policy was eliminated in 1994, however, the legacy it has left behind is considerable. Many Black communities are still severely impoverished, and although efforts are being made to right the wrongs of apartheid, amongst which includes addressing the lack of facilities and resources within some communities, there are still dire consequences. Individuals may be insufficiently educated, unskilled and disempowered, and

from this position struggle to meet their basic needs. Within this framework, the development of children within these communities is negatively impacted. Much literature has explored the negative impact of low socio-economic status (SES) on development, which will be elaborated on in Chapter 3. As explored, the GSMD is ideally suited for use within the multicultural society of SA, and given their flexible nature are able to accommodate for diversity amid the historical background from which individuals originate.

1.6 Problem Formulation and Aims

Despite SA being a country where a significant number of infants and children are infected with HIV or have AIDS, there is limited research regarding their development. Consequently, this is an area of research that is currently receiving more attention, although the present study is the first of its kind to track the development of HIV positive/AIDS infants and children longitudinally.

Although many HIV positive children do not survive to school going age, it is hoped that with the onset of antiretroviral therapy (ART) for all HIV infected individuals, life will be extended. All children have the constitutional right to care and education, thus intervention is needed to provide such care and education, and best assist them to best meet their potential.

The stimulation of weaker areas is fundamental to the promotion of their growth and optimisation of their progress. Thus, tracking the development of HIV positive/AIDS infants and children would be useful to demarcate developmental areas that need attention. Such knowledge could be used to generate therapeutic intervention programmes to promote development, and as such would be valuable to parents, guardians, medical practitioners, teachers, care-givers, AIDS havens, and all others who are the minders of these children.

Thus, the primary aim of the study was to explore and describe the developmental profile of Black HIV positive/AIDS infants and children, from lower SES, aged three to 35 months over two assessments, in the Nelson

Mandela Metropole, utilising the Revised Extended Griffiths Scales of Mental Development (GSMD).

1.7 Chapters of the Study

Chapter 2 concentrates on HIV/AIDS, and on providing an understanding of how the virus functions, examining its history and effects to date, both globally and locally, its transmission and impact, particularly with regards children, and its detection and treatment.

Chapter 3 examines development of the child. It defines development, and examines its occurrence normally, as well as when influenced by the virus, and by SES. This exploration occurs within the various domains of child development, namely, physical and motor, cognitive, and socio-emotional. This chapter furthermore investigates developmental assessment, defining it and providing an overview of various assessment measures that are widely used to assess the development of infants and young children worldwide.

Chapter 4 focuses on the particular assessment tool used within the current study, the GSMD. In so doing the background to the GSMD is given, along with a description of the scales. The standardisation process is explored, as well as normative and clinical studies conducted that illuminate the effectiveness of the scales. Finally, the revision of the scales is examined, and the restandardisation process is explained.

Chapter 5 examines the aims and methodology employed in the present study. It formulates the problem and aims, and explores the methodology applied by looking at the research design, sampling methods, assessment measures, procedures, and data analysis methods that were employed. Finally it reflects on the ethical considerations that were maintained within the investigation.

Chapter 6 presents the results of the study, and thus examines the performance of participants over two assessments, and through descriptive

statistics describing the differences in their performance at both assessments, and at the various year levels.

Chapter 7 finally considers the main conclusions of the study, as well as limitations that need to be considered when interpreting these results, and contemplates recommendations for future research.

Chapter 2
THE DISEASE PROCESS OF HIV/AIDS

2.1 Introduction

Chapter 1 introduced the present study and provided a framework for the research, specifically in terms of knowledge of HIV/AIDS and children, child development, and developmental assessment. It further outlined the use of the GSMD in developmental assessment, revealed the research problem and aims of the present study, and finally gave an outline of chapters presented.

Chapter 2 now focuses on HIV/AIDS. It provides an understanding how the virus functions, examining its history and effects to date, both globally and locally, its transmission and impact, particularly with regards children, and its detection and treatment. In so doing it attempts to contextualise the disease under investigation.

2.2 Introduction of HIV/AIDS

HIV/AIDS is present in all areas of the world, the prevalence of which has reached pandemic proportions. Presently there is no cure for this disease, and as such the creation of knowledge about it is important. This empowers communities by providing the tools and means for controlling the disease, and allowing for the assessment of its social and economic impact in order to contain and minimise its effects. To this degree research into HIV/AIDS is ongoing. To understand the virus, the way in which if functions and spreads will be explored, its effects to date both globally and locally, its transmission and multileveled impact, particularly with regards children, and its detection and treatment will also be examined.

2.3 Defining HIV/AIDS

2.3.1 Structure of the immune system

The various organs and tissues of the immune system are found throughout the body. The working units, immune cells, are produced in bone marrow. They may mature in other parts of the body, but function collectively in the immune system, with the aim of destroying abnormal cells and infective organisms such as bacteria, viruses, and fungi. These key immune cells are monocytes, macrophages, lymphocytes, tissue cells and certain brain cells (Moore, 2002).

Lymphocytes particularly are central to the immune response, carrying out the activities of the immune system. There are two main classes of lymphocytes, namely T-cells and B-cells. T-cells may further be divided into cytotoxic T-cells, which activate the natural killer cells within the immune response, and regulatory T-cells, also called CD4-T cells or helper cells, and within this context will be referred to as CD4 cells, which regulate the immune response.

2.3.2 Cell-mediated immunity and humoral immunity

Macrophages enter body tissues, and through phagocytosis engulf foreign particles. They initiate a further immune response by displaying particles of the invader called antigens on their surface. CD4 cells become sensitised to the antigen displayed, and bind to the macrophages. The product of the union is the release of chemical substances that ultimately instructs other cells within the immune system, particularly CD4 cells and killer T cells, to multiply (Cancer Research Institute, 2004). This process is called ‘cell-mediated immunity’ (Brannon & Feist, 2004). Thus, an army of sensitised or cytotoxic killer T cells attack the invaders to which they are sensitised. Furthermore, the proliferating CD4 cells activate the B cells to differentiate into plasma cells, and secrete antibodies. Antibodies bind to the antigens of the invader making duplication difficult and marking them for

phagocytosis by macrophages and chemical substances called complement in the blood (Brannon & Feist, 2004). This virus specific immune response is called humoral immunity (Brannon & Feist, 2004), and as is evident CD4 cells are pivotal in its initiation.

After the foreign particles are destroyed, activated T and B cells are turned off by suppressor cells, and memory cells remain behind to activate the immune response more quickly if the same foreign particle materializes again (Cancer Research Institute, 2004).

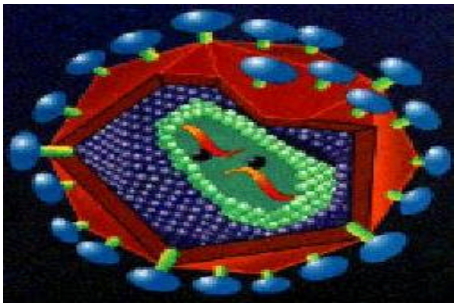
2.3.3 Mechanisms of the virus

The Human Immuno-deficiency Virus (HIV), like all other viruses, uses the genetic material (DNA) of other cells to replicate (Katalan, 2003). HIV, in so doing, breaks down the body's ability to defend itself against infectious diseases by the destruction and/or functional impairment of CD4 cells, hence interfering with the mechanisms needed for cell-mediated immunity and humoral immunity. HIV disease progression is lengthy as HIV is a slow acting lentivirus with a long incubation period (Belman, 1992). Usually only after three to seven years is enough HIV produced to destroy immune cells to the degree that immune-deficiency occurs (Evian, 1995).

HIV is termed a retrovirus meaning that it can undergo a biological process whereby it changes genetic material via a single RNA strand into a double DNA strand; an enzyme called reverse transcriptase enables the virus to do this (Evian, 1995). HIV targets the CD4 component of macrophages and CD4 lymphocytes, as these are the cells to which the virus is best able to attach itself in order to gain entry. Although the initial target of HIV is macrophages (Moore, 2002), CD4 lymphocytes are most popular as the meiotic process is able to proceed at a substantial rate within them (Foundation for Professional Development, 2003). Figure 1 shows a visual representation of the HIV virus (Hodgkinson, 2001, p. 4), illustrating how its structure lends itself to attachment to cells.

Figure 1

Visual Representation of the HIV



A glycoprotein on the outside of the virus fuses with the CD4, injecting its genetic material into it. At this point the HIV cannot be destroyed by the body's usual mechanisms (cellular immunity and humoral immunity). Next the reverse transcriptase reaction occurs, and the virus changes its RNA to DNA, enters the cell nucleus, and is incorporated with the cell's genes. Viral components are included in this amalgamation. In so doing the replication formula is changed, and when replication occurs, viral chromosomes are copied and new viruses are produced (Moore, 2002). In the process the host cell serves as a reservoir for the virus, and as a result is damaged or destroyed (Evian, 1995). New virus particles mature quickly, and infect new CD4 cells in rapid cycles.

2.3.4 Disease progression

Initially HIV is drawn to the tissue of the lymphatic system where CD4 cells are most prevalent. There is an increase in viral components in the body and a decrease in CD4 cells. However, humoral immunity develops, usually within three weeks to three months, which curbs viral replication. The presence of antibodies signify patients to be HIV-seropositive. The production of HIV and antibodies occurs concurrently in massive quantities and a dynamic equilibrium between production and continuous clearance develops, with an estimated 100 million to 10 billion virus particles being produced and cleared every 24 hours (Foundation for Professional

Development, 2003). This production and clearance occurs for the course of the disease. The rate of clearance is reasonably comparable in all individuals, whereas the rate of virus production varies. Consequently clearance of HIV is mostly faintly slower, leading to a gradual increase in the amount of HIV in the system. It accumulatively results in the destruction of the lymph node architecture. This destruction leads to a release of the virus and other pathogens into circulation, and the dynamic equilibrium between HIV and immune response shifts as virus production convincingly exceeds the rate at which immune cells are produced (Foundation for Professional Development, 2003).

Simultaneously, there is a reduction in cell-mediated immunity. Secondary B-cell dysfunction occurs leading to abnormal B-cell response and consequent defective humoral immunity (Elmer & Elston, 2003). Thus the immune system becomes more vulnerable to attack and immunosuppression results. The result is the proliferation of opportunistic infections (OI's) and malignancies, and hence the individual becoming progressively more ill. Accordingly, high levels of HIV, viral antigens, and HIV nucleic acids (DNA and RNA) in the body predict immune system deterioration and an increased risk for developing AIDS (Centers for Disease Control, 1999). As is evident, individuals do not die of AIDS, but due to OI's against which they are not able to defend themselves. These are generally called AIDS related illnesses.

2.3.5 Immunity strength

The amount of HIV in the blood, namely the viral load, conveys how quickly HIV is destroying the immune system. Virus production governs the rate of CD4 cell destruction (Foundation for Professional Development, 2003), and as such a decrease in CD4 cells is linked to an increase in the viral count.

A CD4 cell count together with the viral load indicates the health of the system, although a CD4 percentage (the number of CD4 cells as a proportion of the immune system) is used to assess the health of the immune system

and rate of progression of the disease. A CD4 percentage below 25% is seen as an indication of immune-system damage, while a percentage below 15% indicates severe damage (Nam, 2004). In a healthy immune system approximately 1200 CD4 cells are found per microlitre (/uL) where as an individual is classified with AIDS when their CD4 count falls below 200cells/mm3. At this point the individual is vulnerable to viruses and foreign bodies against which it cannot defend and is then most susceptible to developing OI's.

The infant's immune system develops in the first year of life (Brannon & Feist, 2004) and thus differentiation and maturation of CD4 cells in the immune system is heightened. Within this immature system infection differs to that of adults and consequently factors that influence the functionality of immune cells remain largely undefined (Henderson, 2000). Thus percentages that signify the health of the immune system of HIV positive children differ to that of adults. Their viral load may be very high in the first year of life. However, young children can become sick even when their CD4 count is high, and are particularly sensitive to early B-cell (antibody) dysfunction (Church, 2000).

Infants born to HIV positive mothers carry HIV antibodies, transmitted to them from their mother. This may not indicate HIV infection per say, and will naturally decline slowly between the ages of one and five years (Nam, 2004), and if the child is not infected, will disappear completely. Discerning HIV infection from carrying HIV antibodies occurs through HIV testing in the first few weeks after birth.

2.4 The History and Spread of the Epidemic

HIV/AIDS was first reported on in America in 1981, when a number of men developed a rare type of pneumonia caused by a parasite called *Pneumocystic carinii*. These men were all homosexually orientated and between the ages of 20-45. They all developed severe immuno-deficiency which led to the development of this rare pneumonia. Shortly thereafter, health care workers in Central Africa discovered a disease causing severe

weight loss and diarrhoea, which they called ‘Slims disease’. This disease was also due to immuno-deficiency and was present in heterosexually orientated people. In September 1983 scientists discovered the particular virus to be the cause of this new disease, AIDS (Evian, 1995). HIV infection was then noted in various areas across the globe.

Scientists in France and America identified the virus although it was only named in 1986, after ongoing debate to reach agreement on the name Human Immuno-deficiency Virus (HIV). As the number of HIV infections grew, it became evident in America that four groups were most susceptible to contracting the virus. These groups became known as the “Four-H Club”, that is to say Homosexuals, Haitians, Heroin addicts, and Hemophiliacs; later a fifth category, Hookers, was added (Katalan, 2003). In late 1984 dissatisfaction was expressed in medical publications against the stigmatisation of individuals with AIDS in associating them specifically with these groups, and awareness of vulnerability of all groups started to grow (Katalan, 2003).

Eighteen months after HIV was first detected unexplained immunodeficiency was first noticed in infants born to ‘at risk’ mothers. Soon after, a syndrome now known as ‘failure to thrive’ also became evident whereby the infants failed to grow and develop (Johnson et al., 1989). It was immediately obvious that the root of the problem was the carry over of the infection from mother to child (Foundation for Professional Development, 2003). Thereafter HIV in children was tentatively explored. Less is known about the coarse of the virus in children, as compared with adults, and this underlies the urgency to generate more knowledge in order to help children battle the disease.

Specimen analysis indicates that HIV infection has been present since 1959 (Kaplan & Saddock, 1998). Research has delineated much information about the disease, and it is particularly known for its ability to transform itself within the body. Two strains of HIV have been distinguished, namely HIV~1 and HIV~2. The strains are essentially comparable other than HIV~2 being mainly isolated to West Africa, and HIV~1 is found more broadly

across the rest of the world. Statistics to date show that in the time taken to understand the factors surrounding HIV, the virus has metastasised, and even if HIV transmission ceased, the consequences of dealing with those currently infected would remain for many years to come.

2.5 Statistics

It is important to ascertain the severity of HIV/AIDS infection in each region in order to address and control the disease. To this degree HIV surveys continue to be conducted worldwide. Within SA this has occurred at antenatal clinics since 1992. HIV surveys are performed at antenatal clinics as pregnant women who attend them represent a cross-section of society (Whiteside & Sunter, 2000), and are thus used as a basis from which to estimate statistics of men, non-pregnant women and children.

2.5.1 World-wide impact

On a global level it is estimated that 60 million people have contracted HIV, and 20 million have died from AIDS related illnesses (UNAIDS, 2002c). Currently, 42 million people are living with HIV/AIDS (UNAIDS, 2002b), of which there are 1.2 million children worldwide under the age of 15; 16 000 become infected with HIV daily (World Bank, 2000). These estimates are generated in 2002 and do not include progression over the last two years.

Figures of 2002 alone indicate five million HIV infections and 3.1 million AIDS related deaths (UNAIDS, 2002b). But what has further become evident is the prevalence of HIV among younger individuals, with 30% of infected individuals under the age of 24, and the majority of new infections seen in individuals between 15 and 24 years of age, constituted mostly in most developing countries (DFID et al., 2003).

It is clear that the HIV positive population is continuing to increase, as is the number of AIDS related deaths. Disease progression can be seen in the dramatic increase in statistics generated. It is estimated that 460 000 children died due to AIDS related illnesses in 1997 (NIAID, 2004), while by

1999, 610 000 children died (UNAIDS, 2002b). To date the accumulative figure is at approximately 3.2 million children under 15 years of age (NAIAD, 2004a).

When examining the effect on children, estimates for 2003 show that 2000 children under 15 years of age become infected with HIV (NIAID, 2004), and 1600 children die of AIDS related diseases daily (UNICEF, UNESCO, WHO, 2002). To date over 13 million children have lost their mothers or both parents to AIDS (DFID et al., 2003). The disruption in the lives of adults and children alike is immense, with changes on social and economic levels most evident. This said, HIV has had a differential impact on various areas of the globe according to resources available to control the disease, as well as the level of proactivity in the approach taken by regions to control and contain transmission. In 2002, UNAIDS published the following estimates of HIV/AIDS deaths globally (Katalan, 2003, p. 36):

Table 1

Global Estimates of HIV/AIDS Deaths

Region	Adults & children living with HIV/AIDS	Adults & children newly infected with HIV	Adult prevalence rate	Percentage of infected adults who are women
Sub-Saharan Africa	29.4 million	3.5 million	8.8%	58%
North Africa & Middle East	550 000	83 000	0.3%	55%
South & East Asia	6.0 million	700 000	0.6%	36%
East Asia & Pacific	1.2 million	270 000	0.1%	24%
Latin America	1.5 million	150 000	0.6%	30%
Caribbean	440 000	60 000	2.4%	50%
Eastern Europe & Central Asia	1.2million	250 000	0.6%	27%
Western Europe	570 000	30 000	0.3%	25%
North America	980 000	45 000	0.6%	20%
Australia & New Zealand	15 000	500	0.1%	7%
Total	42 million	5 million	1.2%	50%

In viewing these statistics it is evident that the higher prevalence of HIV infection is centred on developing countries. UNAIDS reports predicts that the pandemic will still take off in the world's two biggest populations, that of China and India, where they are likely to have a severe impact (Moore, 2002). Although it is evident that the disease is progressing rapidly, it is still in its early stages. It is estimated that only 10 percent of the illness and death that this epidemic will bring has been seen (World Bank, 2000).

2.5.2 Sub-Saharan Africa

More than 95 percent of all HIV-infected people live in developing countries, which according to WHO equates to about 36 million people (WHO, 2002). Almost nine tenths of new infections occur in Sub-Saharan Africa (NIAID, 2004a), an area that hosts around 70% of the global total of HIV infected adults and 80% of the children. It is one of the poorest regions in the world, and regrettably holds the highest distribution of HIV positive people, with 29,4 million infected by 2002 (UNAIDS, 2002b), which equates to two thirds of the worldwide total (World Bank, 2000).

The level of prevalence cannot help but have a tremendous impact. Effects can already be seen in a decrease of the average life expectancy in this region, which has dropped to 47 years of age; without the onset of AIDS the life expectancy would have been 62 years (UNAIDS, 2002c). Hence in nine African countries with an adult prevalence of 10% or more, HIV/AIDS will erase 17 years of potential gains in life expectancy (World Bank, 2000).

Twice as many young women than men are infected (Katalan, 2003) and thus it is not surprising that almost three million children under 15 are living with HIV (UNAIDS, 2002b). Furthermore, nine out of 10 new infections are found in this age cohort (Foundation for Professional Development, 2003). In seven countries in Sub-Saharan Africa the under five mortality rates have increased from between 20-40% (UNAIDS, 2002c). By 2000 there was an estimated 7,8 million AIDS orphans in the region (World Bank, 2000).

Across the region, 40 countries have completed national strategy AIDS plans (Katalan, 2003), which is a positive sign for the stance being taken against the disease. However, there is such a vast majority of people who are currently HIV negative, efforts to support them in remaining so need to be implemented directly in order for the prevalence of the disease not to escalate even more.

2.5.3 South Africa

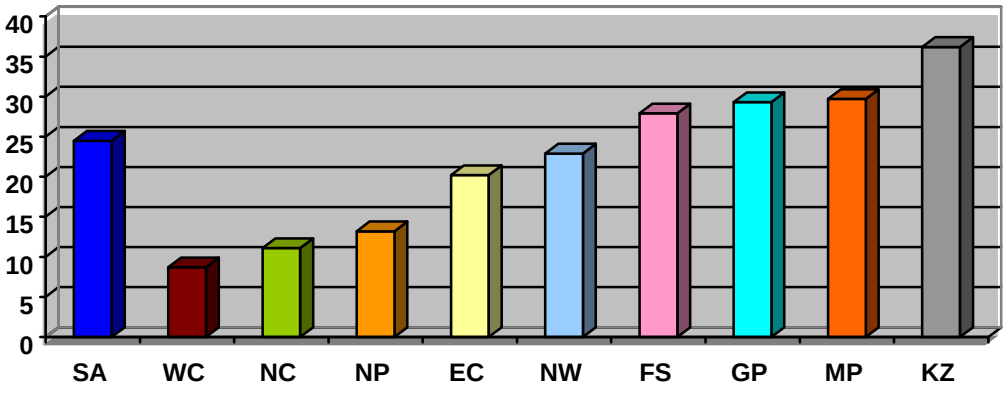
Geographically South Africa (SA) falls within the region of Sub-Saharan Africa. Within its borders, SA has an infection rate of approximately 20%, and it is estimated that 4.7 million of the population of 39.9 million individuals are infected with HIV (UNAIDS, 2002b). This is approximately one-in-nine South African's, which indicates that SA has the largest proportion of HIV infected people in the world (UNAIDS, 2002a). It is interesting that these statistics may be seen against the backdrop of SA's epidemic being younger than other African countries, with the estimation that the South African epidemic was nine years behind countries such as Uganda and Kenya (Katalan, 2003). However, with over half the new HIV infections in Southern Africa occurring in SA (World Bank, 2000) it is evident that the infection rates have grown drastically since the 1990s (Katalan, 2003), with the Medical Research Council reporting that 40% of deaths in individuals aged 15-49 to be AIDS related (Christianson, 2001), and one in every four women aged 20 to 29 reported to be HIV positive (Kotras, 2001).

The prevalence of HIV differs within the various provinces. SA's population is relatively mobile, with a good transport infrastructure, which means that HIV has spread throughout the country (Whiteside & Sunter, 2000). However, the epidemic does show different patterns and may be at different stages of its growth in different regions (Katalan, 2003); thus its progression is not uniform. The National Department of Health (2001) released estimates of individuals infected with HIV as broken down per province in 2001. It is important to note that, as said, statistics are based

on surveys of clients attending antenatal clinics, and do not include private and medical aid clients, as the disease it not notifiable at present (Moore, 2002). Thus, figures of individuals with HIV could be higher. Thus, Table 2 represents the percentage of HIV positive women attending clinics as collected in 2001 (Moore, 2002, p. 10).

Table 2

Antenatal HIV Survey Results by Province in South Africa in 2001



SA	South Africa	NW	North West Province
WC	Western Cape	FS	Free State
NC	Northern Cape	GP	Gauteng Province
NP	Northern Province	MP	Mpumalanga
EC	Eastern Cape	KZ	Kwazulu Natal

According to the South African Department of Health there is a stabilization of HIV/AIDS in some areas of SA. The Eastern Cape, the area that is the focus of this study, cannot attest to be among these areas, where the prevalence rate of HIV infection has progressively increased, and is now at 29,9% (Katalan, 2003). In 1998, 326 AIDS related deaths were reported; that increased in 1999 to 818 and in 2000 to 1000 (ATICC, 2001). By 2002 there were 7976 new reported cases of HIV infection; 1400 people were reported to die of AIDS related illnesses, and the mean age at death was 29,4 years (ATICC, 2002).

In 1999 18% of women attending antenatal clinics in this area were HIV positive (Whiteside & Sunter, 2000). Currently, at least two babies are diagnosed with HIV, and there are two AIDS deaths a week in this region (Whiteside & Sunter, 2000).

The death of so many has dire consequences for the children of SA. In 2002 it was believed that SA had 700 000 HIV/AIDS orphans, and this figure was projected to increase by between 70 000 and 100 000 per year (The Times, 2002). It is estimated that nearly one million South African children under 15 will have lost their mothers to AIDS related illnesses by 2005 (Whiteside & Sunter, 2000).

From these statistics it is clear that the HIV positive population is continuing to increase, as is the number of AIDS related deaths. Expectation is that the number of AIDS related deaths will increase substantially for many more years (Whiteside & Sunter, 2000). Certain groups are more susceptible to acquiring HIV infection. Women are particularly vulnerable to HIV given social and cultural norms that perpetuate their low status in society, and economic dependency. Furthermore, as HIV infection rates rise in the general population, new infections are increasingly concentrated in younger age groups. 54% of the South African population is below 25 years of age, and 12 percent is below five years of age (Whiteside & Sunter, 2000). Thus a large portion of the population falls within a younger cohort, which may also be more vulnerable to HIV infection, for similar reasons.

The Eastern Cape is one of the poorest areas in SA where high levels of unemployment promote migrant work where people leave home to work further afield. There is a natural need for sex and intimacy which results in multiple-partner sexual relationships, behaviour which increases the risk of HIV infection (Evian, 1995). Furthermore, people often use alcohol and drugs to escape the hardships of everyday life; such behaviour leads to a decrease in inhibitions, and thereby an increase in sexual behaviour (Evian, 1995). High levels of unemployment cause a growing number of women to generate money through prostitution, putting them at risk. Rising rural to urban migration helps to spread the disease to different areas, and high

levels of illiteracy create a barrier to education of the cause and prevention of the disease. With an increasing HIV population, and limited resources, health services are minimal at best, and individuals do not always have access to services that are available (Evian, 1995). These factors all come into play in poverty stricken areas. Therefore poverty creates the conditions that help the spread of HIV, and AIDS further causes poverty. Addressing problems that result from these socio-economic factors would then be a starting point to help reduce the spread of HIV.

2.6 The Effect of the Epidemic

2.6.1 Macro level

Since its first appearance the accumulative effect of HIV/AIDS has grown steadily more severe. At a macro level this impact is slower in surfacing, but inevitably the cumulative weight of death and illness underlie long-term social and economic consequences that are, or will in the nearby future, more evident.

2.6.1.1 Structure of society

As the number of AIDS related deaths increase, the effect on a macro-level of society becomes evident in family systems, in a transformation of the structure of society. There is an increase in the prevalence of the extended and child-headed family system, as well as the amount of orphans. The orphan pandemic threatens to overshadow the HIV pandemic as both HIV positive and negative children are affected (Monk, 2003). UNAIDS estimates the number of orphans currently at 13.2 million worldwide (Monk, 2003) and that this figure will double by 2010 (Monk, 2003). An increasing number of these orphans are HIV positive.

The consequences for child development are severe. Children are in impoverished environments that strive to meet their basic needs, many in

rural areas with few facilities and manpower, and as a result developmental stimulation is secondary. This leads to a decline in the quality of socialisation of children, due to factors such as unstable backgrounds, less supervision and child parentification. The combination of these factors may result in a general decline in the moral fibre of society. Secondly, an increasing economic burden is placed on the government to provide both parental and health care to children in need.

2.6.1.2 Education

Children with HIV experience frequent separations from their primary caregivers (Chase et al., 1995). This may occur for a variety of reasons, but is often due to multiple demands within the family to care for others, or illness of either child or caregiver. This separation can severely impact the development of the child. It may interfere with the attachment process between child and caregiver, which is particularly important in the first two years of life (Sigelman & Rider, 2003). Attachment is vital to the development of emotional maturity, and is particularly evident in the child's sense of security (Sigelman & Rider, 2003). Children receive less attention and stimulation, which results in a deficit in social skills and knowledge (Whiteside & Sunter, 2000). This deficit in combination with delayed emotional maturity negatively impacts their readiness to learn.

As early childhood education is not compulsory, children may only receive assistance in the development of their skills once they enter the formal educational setting, although many HIV positive children do not survive to this age. Those who do are at a disadvantage due to their lack of stimulation. It has been found that HIV positive children generally show developmental abnormalities, cognitive or motor impairment, or no history or loss of milestones (Belman, 1992). Although they do acquire new skills, they do so at a slower rate than expected for their age (Belman, 1992). This suggests that HIV may compromise the usual developmental pattern, and as such it may be deduced that children who are HIV positive require greater

assistance in the development of their skills. This is concerning as many HIV positive children, due to their lack of attention at home, are in fact receiving less stimulation.

The presence of HIV causes a general decrease in numbers of students in formal education, due to sometimes dual pressure on children to provide, particularly in child headed families, as well as care for sick individuals. Lack of education leads to an increase in illiteracy, and thus an increase in individual vulnerability (DFID et al., 2003) and is a long-term threat to development. The education system is further compromised by a loss of educators to AIDS related illnesses. Alternatively, many educators are themselves either ill, or caring for affected family member(s), and hence there is a decrease in the quality of education provided, as they are unable to function as before.

The impact is both moral and economic in producing a sector of the population that is illiterate and unskilled to meet their needs. The general decline in the quality of education is further concerning as education effects the way communities respond to HIV, and is an important prognostic indicator to what recovery will be like after the epidemic.

2.6.1.3 Health

As the amount of people with HIV/AIDS increase, economically there will be a general diversion of resources into care, in medical aids and disability cover. When individuals are themselves unable to pay for health care, there is greater pressure on government to do so for them.

With more people requiring hospitalisation, the quality of care provided by health systems is reduced. The health care system lacks the infrastructure to deal with the vast numbers of individuals, and has become stretched to capacity. Consequently many individuals with HIV/AIDS are being cared for at home, which places much pressure on the family systems. The disease further impacts the health care system in the form of loss of its own health personnel to death and illness (World Bank, 2000). Thus the

health system itself can be seen as under strain to maintain integrity in face of a declining level of effectiveness.

2.6.1.4 Economy

Investment savings will decline as higher socio-economic groups spend savings and sell assets in order to meet their health and living costs. These factors will ultimately affect economic growth as, having run out of assets to sell, there will be added pressure on a national level for governments to provide care.

Half of all new infections are in individuals under 25 years of age (Meldrum, 2002), which implicates a large proportion of the active work force, rendering them incapable of contributing productively to the economy. Thus AIDS is draining human resources at an increasing rate, and in the process ruining the capacities on which the future of sustainable development depends (Meldrum, 2002).

The Gross Domestic Produce (GDP) is estimated to drop, for numerous reasons. There is a fall in productivity generally, due to sickness and fatigue, low morale, absenteeism and organisational disruption. The predicted reduction in the pool of skilled workers will affect the organisational memory, and costs are thus projected to increase as businesses compete to capture the expertise that is available. Further monies will need to be spent on recruitment and training of new employees.

Not only is the South African economy endangered, but its decline threatens many of its neighbours due to the interconnectedness of many economies to that of SA (World Bank, 2000).

2.6.2 Micro level

2.6.2.1 Effect on the community

Various factors in each region determine the influence of HIV/AIDS, such as the rate of infection, prevalence to date, and resources available to deal with the disease. Consequently, contextual information as to the severity of the HIV/AIDS problem is vital for the development of tools to address the problem at a community level. The degree of education regarding the disease varies, and this affects social interaction patterns within the community, as education reduces fear and prejudice, which influences how communities deal with the disease. High levels of fear and prejudice cause family systems to be excommunicated from their communities when it becomes known that a family member has died of AIDS related illnesses. The prejudice, discrimination and rejection associated with the disease is even more difficult to cope with than the disease itself (Evian, 1995). The stigma of HIV/AIDS devalues people, and lack of support from the community isolates them (UNAIDS, 2003).

2.6.2.2 Effect on the family

HIV/AIDS has an impact on various levels, and problems range from medical conditions to psycho-social problems, within individual and family systems. Initially the influence of HIV/AIDS to the individual is on a physical and emotional level, as the bodies of individuals with HIV weaken in their ability to fight off opportunistic diseases. As they weaken damage extends to neurological and neuropsychological impairment as well (Moore, 2002). As individuals become more ill they are unable to function as before, and thus their quality of life is destroyed before life itself is taken away (DFID et al., 2003). This has an effect on the family and social systems to which individuals belongs.

Initially the family is then impacted financially, as it often loses its primary income earner, and consequently its very survival may be threatened. Expenditure increases with an increase in demands of medical care, thus the family sells its assets and exhausts its savings and is pushed deeper into poverty, consumed with health costs and funerals. In addition, the earning capacities of caretakers are reduced as they care for affected individuals (Moore et al., 2004).

As individuals become more ill the structure and behaviour of the family system changes as it is placed under pressure to take over the roles usually undertaken by each sick individual. Invariably women are left to take on this responsibility. They then have the roles of workers, caregivers, educators and mothers. Concurrently their legal, social and political status makes them vulnerable to HIV/AIDS (UNAIDS, 2002c). On diagnosis HIV individuals have to deal with the impact and psychological distress of having a chronic illness for themselves, their partner, and perhaps their child(ren). Adjustment to the HIV diagnosis is wrought with guilt for passing the illness on, feelings of isolation/discrimination, and feelings of loss of normality (Belman et al., 1985). Consequently individuals may experience feelings of shame, depression, withdrawal, worthlessness and guilt (UNAIDS, 2003). Thus, along with their physical deterioration, individuals deal with various psycho-social dynamics that may negatively impact the way in which they cope with the disease.

Combined with the further loss of assets, the households' capacity to produce and purchase food is permanently affected when the individual dies.

2.6.2.3 Effect on the child

With parents being increasingly incapacitated to function as before, family burdens shift to children who often take over the duties of heading the homes, and bringing in an income (Whiteside & Sunter, 2000). Poverty is exacerbated within the family through the loss of a parent, and this compounds the psychological trauma that children face (Monk, 2003). The

psychological impact of watching a parent deteriorate and die is severe. The levels of grief are acute, and typically involve much anxiety, anguish and depression for the child. Distress is compounded by the likely lack of social support, due to the stigma of HIV.

The problems that children face as a result of HIV/AIDS begin long before their parents die. Children often live with sick relatives in households that are stressed both financially and emotionally, experiencing frequent separations from their mothers or other primary caregivers. There is a decline in the socialisation process, as children do not develop social and moral skills as efficiently as they may have. The child is typically involved in an extended family system, but supervision is not as immediate as in the nuclear family. Children are more likely to be undernourished, less likely to receive immunisations or health care, and there is an increase in the likelihood that they end up on the streets (World Bank, 2000). Due to HIV they are stigmatised and socially isolated from their peers. Economic hardship and the need to replace lost adult labour often forces them to drop out of school and thus there is a decline in formal education.

Children who are themselves HIV positive face these pressures, as well as having to deal with the decline of in their own functioning. Furthermore, they have to come to terms with the stigma and discrimination that they themselves experience. These pressures, too, may negatively impact on their own health, as research examining the effects of HIV on child development has linked negative life events to adversely affecting the immune status of children (Henderson, 2000).

The role of support and counselling of HIV positive individuals, and the families affected by HIV, is of necessity in providing information regarding issues such as living healthier lifestyles, safer sexual practices, and the availability of support systems, etc (Evian, 1995). Furthermore, to counter the stigma it is of necessity to provide such information as to increase the capacity of individuals to deal with the social pressures, as well as decrease the social pressures themselves. Along with education, the development of services at a community level to address the needs of HIV positive children

is vital, and this specifically should include special supports that promote developmental progress, such as evaluation, training and education (Rudigier & Crocker, 1990). However, HIV/AIDS is seen in combination with these other crises', with the distribution of resources to meet basic needs as the foremost priority. Many countries, especially SA, lack the resources to deal with the problems caused by, and perpetuated by the disease.

As yet there is no cure to HIV/AIDS. Antiretroviral medication that slows down the course of the disease is costly, and although action has been taken recently towards providing medication to the general public, at present only a relatively small percentage of HIV infected individuals have received treatment. Therefore, the mobilisation of enough resources and experience, and equipping and educating people to deal with the issues surrounding HIV/AIDS more effectively is the only tool available to counter the disease.

2.7 Transmission and Mother-to-child focus

2.7.1 Transmission

HIV is a contagious virus, and since its identification in 1981 it has rapidly spread across the world. The process of its transmission has been clearly delineated, and is based on the HIV entering into the bloodstream. HIV is transmitted in three ways (Evian, 1995, p. 11):

- via sexual intercourse
- when HIV infected blood passes directly into the blood stream
- from mother to child during pregnancy, childbirth and via breast feeding.

The primary method of infection in children is through mother-to-child transmission (MTCT), which is the area of concern within the context of this research. Transmission of HIV to young children can occur through sexual or physical abuse by HIV-infected adults, however, it is estimated that 90% of infants and children are infected through MTCT (Foundation for Professional

Development, 2003), and this equates to approximately 600 000 children every year worldwide (UNAIDS, 2002b). In 2001 it was estimated that more than four million children had died due to MTCT (USAID, 2001). In the year 2000, more than 90% of these infants were born to HIV positive mothers in Sub-Saharan Africa (Love Life Report, 2000). On average, 25% of pregnant women in South Africa were HIV positive (McIntyre and Gray, 2000). What is just as concerning is that nine out of 10 HIV-positive women in developing countries are unaware that they are infected (Foundation for Professional Development, 2003). In light of MTCT, these statistics should be seen within the context of a 30% probability (Whiteside & Sunter, 2000).

2.7.2 Mother-to-Child focus

HIV transmission may occur perinatally, during delivery or postnatally, with various factors affecting the likelihood of occurrence. Such factors that increase the likelihood of perinatal transmission are the presence of advanced (symptomatic) HIV disease in the mother, HIV-infection just before or during the pregnancy, or a low CD4 cell count (less than 200 cells/mm3) (Evian, 1995). Other factors that may increase the risk of transmission are maternal drug use, and the severe inflammation of fetal membranes (Meldrum, 2002). The method of delivery furthermore affects the risk of transmission, with an elective cesarean section being linked to a decreased risk for MTCT (Church, 2000), as well as a prolonged period between membrane rupture and delivery (Meldrum, 2002).

Postnatally HIV is spread predominantly through breastfeeding. This method is responsible for the transmission of an estimated one-third to one-half of all HIV infections in developing countries (Foundation for Professional Development, 2003). 95% of infants born to HIV positive mothers are breastfed, and the rate of transference of HIV though this method is around 24% by six months of age (Meldrum, 2002). Alternatives to breast-feeding, formula feeding, may not be available and/or may not be economically feasible Also, incorrect usage of formula can lead to infection, malnutrition

and death (World Bank, 2000). The major benefit to breastfeeding is the transference of the mother's antibodies to the infant, and this is beneficial in terms of decreased illness and death due to other infectious diseases, and provides the better nutritional value compared with formula feed. Thus benefits of breastfeeding could greatly outweigh the potential risk of HIV transmission, particularly in developing countries.

HIV positive women need to receive counselling in order to be aware of these risks, and as such the first step to providing them with support in many cases is revealing their HIV status to them. Accordingly HIV testing needs to become more readily available. Furthermore, the options available to HIV positive women need to be increased, or testing itself becomes irrelevant. This includes the availability of counselling, family planning, and the provision of ART, all of which is support that needs to be sustained.

2.8 Effect on Children

The immunology of infants differs from that of adults in that the immune system of the infant is not fully matured. Therefore HIV reproduces in an immature, highly active and developing immune system, and consequently does so at an increased rate to that of adults (Church, 2000). It is due to this extraordinary viral replication that there is profound immunological and nervous system dysfunction early on, with dynamic and complex interactions evident between these two systems (Belman, 1992).

2.8.1 Immune system dysfunction

HIV causes a wide spectrum of disease in infants and children (Belman, 1992). HIV positive children suffer the usual childhood bacterial infections more frequently; childhood immunisations may be less effective for them (Foundation for Professional Development, 2003), and they are prone to developing life-threatening OI's. There is a remarkable range shown at the time of onset of symptoms (Johnson et al., 1989), although the majority of infected children will develop disease manifestations by six months to one

year of age; half of infected children will meet the criteria for AIDS within the first year of life (Johnson et al., 1989)

The severity of HIV infection may be classified according to both clinical and immunological classifications:

2.8.1.1 Clinical classification

The clinical manifestations may be divided into four stages according to the severity of characteristics experienced. A breakdown of the clinical manifestations associated with each of these stages may be seen in Appendix A (Foundation for Professional Development, 2003, p. 101). Patients are assigned a clinical and immunological state. Irrespective of whether their class improves substantially with treatment, they remain classified according to their worst state (Church, 2000).

The progression of HIV, whether rapid or slow, is not uniform and according to Kotras (2001) may be influenced by the following factors:

- HIV viral load
- virulence of the virus
- concurrent infections such as tuberculosis (TB) and respiratory infections
- poor socio-economic status and poverty
- children over one year who have AIDS tend to present inter alia with hepatosplenamegaly, lymphadenopathy, perolitis and recurrent bacterial infections, and
- children who have a slower progression of HIV disease exhibit slightly increased incidence of bacterial infections.

2.8.1.2 Immunological classification

The viral load and CD4 count are used to determine HIV progression. The CD4 cell count refers to the amount of CD4 cells per microlitre (/uL) of blood. As the number of CD4 cells in the body decline with age, a CD4 cell

count expressed as a percentage is considered a better indicator of immunological status than the actual count. This percentage is seen as an indication of the health of the immune system.

The viral load refers to the amount of HIV per microlitre (/uL) of blood, and is an expression of how quickly HIV is destroying the immune system. Virus production governs the rate of CD4 cell destruction (Foundation for Professional Development, 2003). A decrease in CD4 cells leads to an increase in the viral count.

The CD4 cells clear the body of HIV, thus it is important for the health of the individual there is a good balance between them. The following table is used for immunological classification for HIV positive infants and children (Foundation for Professional Development, 2003, p. 105):

Table 3

Immunological Classification for HIV Positive Infants and Children

	Age of child					
	< 12 months		**1-5 years**		**6-12 years**	
Immunological category	CD4 µl	(%)	CD4 µl	(%)	CD4 µl	(%)
1. No immunosuppression	>/1500	(>/25)	>/1000	(>/25)	>/500	(>/25)
2. Moderate immunosuppression	750-1499	(15-24)	500-999	(15-24)	200-499	(15-24)
3. Severe immunosuppression	<750	(<15)	<500	(<15)	<200	(<15)

There is a positive correlation between clinical classifications and immunological classification. As the CD4 count declines, children will become more ill, and will show more clinical manifestations.

2.8.2 Central Nervous System (CNS) dysfunction

2.8.2.1 Direct and indirect infection

The CNS is uniquely susceptible to HIV infection (Church, 2000). Nonetheless, it is important to note that there is an assortment of factors that may cause CNS dysfunction. These include metabolic and endocrinologic derangements, maternal conditions during gestation, complications due to prematurity, complications due to underlying medical conditions, psychosocial stressors and iatrogenic problems (Belman, 1992). Thus, before CNS involvement can be attributed to HIV, other causes need to be considered and eliminated. Additional factors that may have an adverse impact in HIV-infected children are low birth weight, poor antenatal care, malnutrition, limited environmental stimulation, prolonged hospitalisation, social isolation and limited parental education (Smith et al., 2003).

This said, Belman et al. (1988) found that 78 to 93% of HIV positive children suffer from CNS dysfunction. As HIV infection evolves into AIDS, the incidence of brain deterioration and eventual damage increases considerably (Lezak, 1995). The age of diagnosis and severity of symptomatic infection are important prognostic determinants; between 70 and 80% of children with Centers for Disease Control (CDC) category B or C disease will develop encephalopathy, with an increased risk for children diagnosed within the first 48 hours of life (Smith et al., 2003). Advanced CNS involvement in children is a frequent and serious cause for morbidity (Cooper et al., 1998).

CNS damage is caused by direct and indirect mechanisms associated with HIV infection (Smith et al., 2003). There are different patterns of dysfunction observed in infants, believed to be dependent on the stage of development at which HIV infiltrates the developing brain tissue (Belman, 1992). Usually the CNS is adept at protecting itself against invasion, through a blood-barrier that prevents foreign substances from entering the brain. However, HIV is able to hide in macrophages and cross over this barrier through them (Kotras, 2001), and so direct infection is accommodated.

Direct HIV infection leads to encephalopathy, the most severe CNS manifestation that causes unique neuropathologic changes (Cooper et al., 1998).

Indirect infection may be as a consequence of opportunistic organisms, usual childhood pathogens, and bacterial infections such as sepsis and meningitis, the consequence of which may be, for example, hearing loss, cognitive deficits, and long tract signs of variable severity (Belman, 1992). Congenital CNS infections e.g. toxoplasmosis, cytomegalovirus are also reported (Belman, 1992). In children, CNS OI occurs less frequently than adults.

The consequence of direct and indirect HIV infection thus varies, the result of which is, furthermore, a range of developmental abnormalities (Smith et al., 2003).

2.8.2.2 Developmental delay

Whether infected directly or indirectly, general CNS involvement may be seen in various ways either in the failure to attain, or the loss of developmental milestones. Developmental delay may be the initial CNS manifestation of paediatric HIV infection, although its presentation may be variable (Smith et al., 2003) as compromises the normal development process in a yet undetermined fashion (Belman, 1992). Children may show abnormalities from birth, or may take a time before presenting with developmental compromise. However, developmental disabilities with which they present often occur in a pattern of plateaus and deteriorations with a largely declining course (Smith et al., 2003). Developmental delay is particularly linked to encephalopathy, which may be static or progressive. Children with progressive disease tend to regress, while children with a plateau course fail to acquire new skills, although they do not loose acquired skills (Smith et al., 2003).

Developmental effects may be broadly divided into two areas, that of cognitive and motor delays. The child may present with a range of motor abnormalities. There may be a loss of previously achieved milestones, or

delays in acquisition of motor milestones, with or without pathologic reflexes; during infancy most of these children show axial hypotonia and poor delayed head control (Belman, 1992). They may show slower brain growth, as measured by head circumference. Progressive motor dysfunction may result in a range of symptoms such as muscle weakness, hyper-reflexia, clumsiness, spasticity, ataxia, muscle tone abnormality, change of gait or spastic gait, and sensory impairment; severe symptoms such as spastic paraparesis, spastic diplegia, or even quadriparesis may also develop (Epstein et al., 1986; Belman et al., 1985; Belman, 1992).

Cognitive involvement in adults with HIV infection may be seen in decline in cognitive speed and flexibility (Poutianen et al., 1996), as well as abnormalities of attention and short-term memory (Chase et al., 1995). Young children cannot always be tested in these domains, though their difficulties may clearly be seen in a loss of previously acquired language abilities, at times showing a decrease in vocalisations. Furthermore, loss of intellectual ability may be associated with marked slowness of mental processing and forgetfulness in adults (Moore et al., 2004), and is evident in a decline in intelligence in children.

Daily living skills of children are impacted. Dysfunction may manifest in various forms, seen in deterioration of play, or loss of previously acquired language and socially adaptive skills (Belman, 1992). As the disease progresses children become apathetic, loosing interest in the environment around them. Children may show development but at a pace that is slower than that expected for their age, and they show a mental age that is lower than their chronological age.

Diagnosis can be difficult, as most youngsters are not tracked from birth. Development may be further adversely effected by factors such as low birth weight, poor antenatal care, malnutrition, limited environmental stimulation (Smith et al., 2003) therefore disability must be weighted in context against environmental stressors to which the child is exposed.

The challenge is to identify neurodevelopmental manifestations of HIV disease, and the delineation of patterns in developmental growth that are

prognostic for the rate of disease progression (Chase et al., 1995). However, there is much variability in neurodevelopmental status and growth. Furthermore, with the onset of antiretroviral therapy (ART) for all HIV infected individuals the progression of HIV will undergo modification, creating new patterns to be delineated.

2.9 Diagnosis of HIV Infection

All testing for HIV is invasive, and may be experienced as traumatic by the patients, to varying degrees. Consequently, it is recommended that patients undergo pre- and post-test counselling, irrespective of the status of their results, by an experienced health professional. Counselling is particularly important when conveying to a parent the HIV status of their infant. Diagnosis of HIV in infants may further be complicated if the parent(s) are unaware of their own HIV positive status. Infants are often tested for HIV when they fail to thrive at birth. Consequently, the counselling situation would need to convey HIV status of infant and parent(s).

When testing for the presence of HIV, preferences for tests are determined by analysis requirements. Tests may be divided into tests that identify the presence of the HIV virus, or identify HIV antibodies. HIV antibody detection tests are the most widely used. The first HIV antibody detection tests became available in 1985 (Moore, 2002). Tests have become more sophisticated as they are improved. They are divided into screening and confirmatory tests, according to their internal test parameters, being test sensitivity and test specificity.

2.9.1 Diagnostic tests based on the detection of HIV antibodies

2.9.1.1 HIV ELISA tests

The primary diagnostic screening method for HIV is the Enzyme-Linked Immunosorbent Assay (ELISA). The ELISA is optimised for test sensitivity, meaning it has the ability to show the presence of HIV antibodies, which is 100% (Moore, 2002). Most individuals will develop antibodies to some of the HIV antigens within the first few weeks of infection. ELISA will predict the presence of these antibodies, although it cannot differentiate between them.

The ELISA is highly reproduceable and provides swift, reliable results. This even more so as the internal test properties have been improved. Third generation ELISA tests can detect HIV antibodies from approximately 23 days, and fourth-generation ELISA from approximately 16 days. There is however a 21-24 day period when the virus is not detectable, and it is advisable to re-test if exposure to HIV is suspected. Furthermore, ELISA is inexpensive, has standardised procedures and provides quick results.

2.9.1.2 Western blot

The Western Blot is the test most often used subsequent to a positive ELISA, for the confirmation of HIV infection. The Western Blot is known for its test specificity, in that it is able to distinguish between the viral components of HIV as it identifies which HIV antigens the antibodies are responding to.

The Western Blot shows the sensitivity of 96%, and has a predictive value greater than 99%, though when used in conjunction with the ELISA has a combined accuracy approaching 100% (Foundation for Professional Development, 2003). However, the Western Blot is expensive, time consuming, and labour intensive. Although it is the preferred confirmatory test, many developing countries do not have the financial means nor the

infrastructure to administer it in large quantities. Consequently an alternative confirmatory method implemented in developed countries is a multiple ELISA test. ELISA shows excellent predictive value, is less costly, and has been proven to be more sensitive for diagnosing early infections (Foundation for Professional Development, 2003).

2.9.1.3 Rapid tests

Rapid tests may be useful in supplying a prompt result, and are especially useful as a screening procedure as they do not require special equipment (Moore, 2002). Tests take about 30 minutes and may be performed on site. However, rapid tests show greater potential for errors and therefore should be used with caution. Whenever they are employed, a positive result should be followed with further confirmatory testing.

2.9.2 Tests for additional clinical information

There are several tests that are used routinely with patients whose HIV status is confirmed, to provide clinical information regarding the health of the immune system at a given point in time.

2.9.2.1 Viral load tests

Tests that measure the viral load show how much of the virus is in the blood. Such tests are performed over a period of time to provide information about the virility of the virus in the immune system.

Three commercial assays are used to measure the HIV viral load (Foundation for Professional Development, 2001):

- amplicator HIV Monitor Assay;
- quantiplex HIV RNA (bDNA) Assay; and
- sequence Based Amplification (NASBA) Assay

2.9.2.2 CD4 count

The CD4 cell count is the dominant parameter used in ascertaining the health of the immune system. A decline in immunity is caused by a decrease in CD4 lymphocytes, which are attacked by HIV. Thereby a CD4 cell count provides information as to the how effective the immune system is able to defend against HIV. Similar to viral load tests, CD4 cell counts are taken over a period of time, in order to gain greater insight into the effectiveness of the immune system by looking at specific trends. This is as there are various factors which could effect the CD4 count, such as illness, use of alcohol, and therefore information regarding the trend created by the virus in the system can be seen more accurately (Ebrahim, 2001).

2.9.2.3 Quantitative HIV RNA

Quantitative HIV RNA measurement is used when there is aim for the implementation of antiretroviral treatment. It accurately indicates how quickly erosion of the immune system is occurring. It thus tells of the severity if HIV infection. It provides valuable information surrounding responses to antiretroviral treatment, and therefore informs decisions.

2.9.2.4 Other

Other tests that are performed, such as for the detection of sexually transmitted diseases, infectious diseases and gynaecological tests, are performed with patients with HIV according to the needs of individuals.

2.10 Antiretroviral Treatment

There is no cure for HIV/AIDS. Much progress has been made with the development of antiretroviral medication to slow down the progression of the disease through their high affectivity in suppressing viral replication.

This has improved rates of mortality and morbidity, improving the quality and length of life of individuals living with HIV/AIDS (WHO, 2002). However, the vast majority of individuals in developing countries have never received ART (UNAIDS, 2002b).

In industrialised countries children can live up to 10 years of age without ART; however, in developing countries 80% of children die within the first 24 months (Evian, 1995; Foundation for Professional Development, 2003). The roll out of ART in South Africa has recently begun, with ART becoming available in the Eastern Cape, the area of this research, in July 2004. The process of making ART available, because of logistical complications, has been time consuming. Although many gains have been made in the distribution of ART, at present ART is only provided to pregnant women and to individuals who have a CD4 count lower than 150-200/uL, and thus are diagnosed with AIDS. Thus, the vast majority of HIV positive individuals still go untreated. It is hoped that in the not too distant future ART will become available to all HIV positive individuals, and that results will prove similar to the research shown in industrial countries where quality of life and lifespan itself is vastly improved.

2.10.1 Classes of ART

There are three classes of antiretroviral drugs used to treat HIV infection (NIAID, 2003).

- nucleoside reverse transcriptase (RT) inhibitors interrupts an early stage of the virus making copies of itself. Included in this class of drugs are nucleoside analogs that may slow the spread of HIV in the body and delay the start of OI's. e.g. AZT.
- non-nucleoside reverse transcriptase inhibitors may be prescribed in combination with other antiretroviral drugs, e.g. nevirapine.
- protease inhibitors may be prescribed that interrupt virus replication at a later step of its life cycle, e.g. Norvir.

Use of antiretroviral medication over time may result in HIV mutations associated with resistance to at least one antiretroviral. To overcome such resistance treatments are combined to increase their impact. HIV can become resistant to any of these drugs used to counteract it. Therefore a blend of treatments is used to suppress the virus. The combination of two RT inhibitors and one protease inhibitor together are referred to as highly active antiretroviral therapy or HAART. HAART has been found to reduce the amount of HIV in the blood to nearly undetectable levels in both children and adults.

2.10.2 Antiretroviral medication and pregnancy

The provision of antiretroviral medication to pregnant women has been thoroughly researched, and has been a contentious issue for some time. In industrialised countries its use has been prolific. In the US the number of infants born with HIV has decreased from +- 1600 in 1994 to +- 200 in 1999, with the combination of heightened media attention and therefore education of people, avoidance of breastfeeding, and the supply of ART to mothers, as well as postnatal prophylaxis of the newborn infants (Church, 2000).

In SA antiretroviral medication has become more readily available to pregnant woman in the last year. Medication may be administered to pregnant women anywhere between 14 and 34 weeks of gestation. Studies show that when administered at the onset of labour, and for a short period postnatally to the infant, this is sufficient to decrease vertical transmission around the time of childbirth, during labour and the start of breastfeeding. Such treatment can reduce maternal transmission of HIV by two-thirds (Meldrum, 2002).

The use of AZT, an antiretroviral drug that is given to pregnant women, is controversial as it has been linked to mitochondrial dysfunction in infants. Mitochondria within the cells transform glucose to energy. Dysfunction of these mechanisms may cause infants to present with neurological

manifestations such as seizures and peripheral neuropathy, and other systemic effects including cardiomyopathy, lactic acidosis, exocrine pancreatic failure and bone marrow failure (Hodgkinson, 2001). A landmark study in 1994 conducted by the Pediatric ACTG showed that AZT produced no serious side effects in mothers or infants. Long-term follow-up of the infants and mothers is ongoing. As a result AZT is now used world-wide in the prevention of MTCT.

The cost of administering ART to pregnant women has been subject to debate, however, economically it is far more viable to treat pregnant women with ART than to deal with consequences of treating the child for its lifetime.

It is hoped that the increased distribution of ART to pregnant women will lead to a decrease in the amount of children who are born HIV positive. Furthermore, it is hoped that antiretroviral medication may soon become more accessible to children who are currently HIV positive, and this would serve to lengthen their lives.

2.10.3 Effect on children

Infections in children evoke clinical features and that are similar to, but more severe than adults (Church, 2000). Thus it is perhaps more important to attempt to treat children in order to reduce such symptoms. Using antiretroviral agents to maximally suppress viral replication is a complex task, which requires careful monitoring. Administration differs to that of adults as there are a number of unique scientific and medical concerns that are important to consider in the treatment of children. Young children require substantially more medication per body weight and have greater caloric and micronutrient requirements (Church, 2000). Age is an important issue as children differ with the amount of CD4 lymphocyte counts and rate of drug metabolism and thereby require special formulations and treatment at various ages. The time of commencement of treatment is also widely disputed.

Furthermore, antiretroviral drugs can have toxic side effects that also produce caring difficulties. These side effects may be stronger in children than they are in adults. Such side effects include fevers, sudden rashes, diarrhea, and tiredness (Gortner, 1997).

Treatment places strain on carers due to required monitoring pressures. Some of the drugs must be taken on an empty stomach, and they general do not taste nice, and need to be taken every day on schedule (Gortner, 1997). Thus compliance is a problem. The most effective way to improve compliance is to improve family compliance (Blanche, 2003).

Research into the development of a vaccine against HIV is ongoing, as is the development of new treatments. To date, HAART can dramatically reduce severe immuno-deficiency and neurologic damage that devastate children (Church, 2000), and as a consequence of its administration can lead to symptomatic improvement in HIV~1 encephalopathy (Belman, 1992), leading to improvement in expressive language abilities, and general adaptive behaviour. Research shows that the immune system of young children has a greater capacity for restoration when treated with new antiretroviral medication (White, 2003). With an increase in international funding, there is a movement towards the provision of HAART to all HIV positive children, and thus is hoped that life will be extended. All children have the constitutional right to care and education. In order to assist them to reach their potential we need to monitor their development to address weaknesses and strengths to increase their quality of life and prepare them for mainstream education.

2.11 Conclusion

To deal with the consequences of the HIV/AIDS epidemic we need to address the root causes of vulnerability and intensify, expand and improve the national response (World Bank, 2000). As such, education is key to provide information and skills, increase the connectedness between people, and thus increase security, increase literacy and give access to trusted adults (DFID et al., 2003).

Successful education needs to occur on a national level in order for this to occur, as it is only through educating people that the stigma and discrimination attached to the disease will be destroyed. Socio-economic decay and breakdown can only be counteracted through unification, and this is unlikely until attempts at educating people about the disease are more fruitful.

Furthermore, developmental services are necessary to address the needs of children with HIV infection. These include evaluation, training and education and other special supports that promote developmental progress like early intervention and special pre-school programming (Rudigier & Crocker, 1990).

2.12 Chapter Overview

This chapter has focused on HIV/AIDS, and has attempted to contextualise the disease under investigation by presenting knowledge of how the disease functions an examining its history and effects to date, both globally and locally, its transmission and impact, particularly with regards children, and its detection and treatment

Chapter 3 now investigates the developing child, defining child development, and by examining its occurrence normally, as well as when influenced by the virus, and by socio-economic status (SES). This is examined within the various domains of child development, namely, physical and motor, cognitive, and socio-emotional. It furthermore investigates developmental assessment, defining it and providing an overview of various assessment measures that are widely used to assess the development of infants and young children worldwide.

Chapter 3
CHILD DEVELOPMENT AND ASSESSMENT

3.1 Introduction

The content of Chapter 2 focused on the HIV/AIDS pandemic. More specifically, on understanding what HIV/AIDS is in terms of its mechanics and progression, the history of the epidemic and its prominence to date both globally and locally, and its impact on both macro and micro levels of societies. Furthermore, its transmission was examined, the consequent effects within the body, its detection, and its influence, particularly with regards to children.

Chapter 3 now examines the development of the child by defining child development, and by examining its occurrence normally, as well as when influenced by the virus, and by socio-economic status (SES). This exploration occurs within the various domains of child development, namely, physical and motor, cognitive, and socio-emotional. This chapter secondly investigates developmental assessment, defining it and providing an overview of various assessment measures that are widely used to assess the development of infants and young children worldwide.

3.2 Defining Child Development

Development refers to the systematic changes and continuities in the individual that occur between conception and death (Sigelman & Rider, 2003). More specifically, it may be described as orderly and relatively enduring changes over time in physical and neurological structures, thought processes and behaviour (Mussen et al., 1990). These changes may be seen as systematic and patterned, and their effect practically is noted in all children progressing through a predictable pattern of characteristics, with a genetic sequence that triggers certain traits appearing at fixed intervals (Hurlock, 1978).

A variety of factors influence the manner in which children progress through these developmental sequences. Kail and Cavanaugh (2000) name four interactive forces that are fundamental to development and combine to form a framework in which development occurs. These include biological forces (genetic and health related factors), psychological forces (perceptual, cognitive, emotional and personality factors), socio-cultural forces (interpersonal, societal, cultural and ethnic factors) and life-cycle forces (how the same event affects people of different ages). They further stipulate that each individual is a unique product of a combination of these forces. Consequently, despite the overall predictability of development, individual differences do exist at all developmental levels and therefore the characteristics of children may be described as shared, as well as idiosyncratic. In the study of development cognisance must then be taken that development itself may be separated into that which may be generalised to all children, and that which is unique to the individual child.

The psychological approach to studying human development is based on the assumption of underlying continuities between behaviours at different points in the life-span (Barnard, 2000), and attempt to understand how interactions between individual and environment at one point in time, make more elaborate interactions at some later point possible (Kotras, 2003). For example, cognitive development of the prelinguistic infant lays the groundwork for the development of speech later on; gross motor development of the toddler lays the groundwork for fine-motor skills later on.

Changes and continuities that are studied in development may be divided into the domains of physical and motor development, cognitive development, and socio-emotional development (Griffiths, 1970). These areas are mutually dependent, and inseparable, as each domain simultaneously influences, and is influenced by others (Nuttal, 1992). They are interdependent in that the one is reliant on the other, for example, physical development may directly impact the child's social development in their ability to play with other children, and thus to develop their social skills. Ultimately the domains come

together for development to form an integrated whole, and when studying development this integrated whole is considered.

To observe the development of the whole child there are various goals that may then be identified. The first goal is to gain an understanding of universal patterns of development. Another goal is to explain individual differences among children, and a third is to gain a comprehension of the contextual influences that affect the behaviour of children (Mussen et al., 1990). A fourth goal is the identification of possible developmental delays as early as possible and in so doing maximising treatment intervention. To achieve these goals effectively it is essential to develop a thorough working knowledge of the stages through which children progress in their development. Stages of development are linked to developmental tasks, and if development occurs as it should, the completion of developmental tasks lay a foundation on which later developmental progress is based (Salkind, 1985). Furthermore, the observation of children to examine the physical manifestation of this development in their interaction has lead to the establishment of developmental norms, with the establishment of criteria against which development and change is evaluated. Consequently, that which is considered normal behaviour can be ascertained and tracked at different ages as acceptable behaviour changes for different age groups. These norms are merely an indication of average behaviour and are not conclusive. Thus deviation from the norm needs to be acute before a child's development is evaluated as advanced or delayed.

As development continues the child becomes increasingly more complex. There are a number of factors that are central to understanding the nature of developmental change. Firstly, development can be seen as a continuous or discontinuous. Continuous development is visualised as a building process, in the accumulation of knowledge and skills to that which has come before, as changes add on to prior abilities. Discontinuous development is envisaged as a process containing relatively sudden changes that are interspersed with gradual change (Newcombe, 1996). Usually development is a combination of the two.

Secondly, the stability of the child's behaviour over time is a variable of significant interest. Children progress through different stages of development, but the stability of traits is examined, and is complicated by the fact that traits may be expressed in different ways at different ages. For example, 'friendliness' may take the form of an infant who smiles a lot that becomes an adolescent who is easily approachable and engaging. Thus the trait 'friendliness' may be examined to ascertain its smooth progression throughout the life span, or its presence in a series of abrupt shifts (Kail & Cavanaugh, 2000).

Thirdly, the nature of the child as passive recipient of experience, or active organiser of the environment is appraised. The passive recipient viewpoint asserts that experience is something that happens to the child in the process of being. Seeing the child as an active organiser assumes that children are co-participants in interactions, and consequently co-participants in their own individual development. The child is intrinsically motivated to develop and as such, debate on this viewpoint tends towards seeing knowledge as actively engaged. The general stance has become that children contribute to their own development, and are not only shaped by the environment, but through their interaction with the world (Bjorklund, 1995). As knowing itself is an active process, activity of child or of the child's structures is necessary for development to occur. More pointedly, in order for structures to change, they must be active.

Finally, the influences of hereditary and environmental forces are possibly the most widely debated as to their effect on the developing child, hereditary being any genetic or biological influences with which the child is born, and environmental forces referring to social, cultural, ethnic and economic influences that impact the child. However, it is only at the moment of conception that we can actually separate these influences (Karmel & Karmel, 1984). Thereafter, they are inextricably linked, and their mutual influence has a crucial impact on the child's development. Their joint effect may interfere with the pattern of development, either causing delay or accelerating the speed with which the pattern normally occurs (Hurlock,

1978). Development itself thus interacts with genetic and environmental factors, for example, it has been shown that the pattern of physical growth is temporarily upset by such environmental conditions as malnutrition, illness, season of the year, or severe emotional stress (Hurlock, 1978). It must be noted that the influence of genetic and environmental factors is differential according to the predisposition and susceptibility of individuals to particular stimuli, and thus what may have a severe impact on one child, may have very little impact on another. For example, a child with a genetic predisposition to the development of allergies may be negatively impacted by seasonal change and thus have impaired ability to take in information learn optimally in pre-school, while a child without this predisposition my not be effected.

These issues are then important to the understanding of development, influencing the conceptualisation of developmental change for the duration of natural life.

3.3 The Development of the Infant and Young Child

Development is never static, but early development of the infant and young child is more critical than later development and sets the scene for later life. Personality studies have revealed that early patterns persist relatively unchanged as time goes on (Hurlock, 1981). Thus within these formative years young children lay the foundations for whom they will become, and in so doing start to act tentatively within their environments, within the limits of their developmental stage. Dividing development into domains aids understanding of the growth of young children.

As mentioned before, separating the domains of development is complicated. For example, when infants begin to crawl they encounter a broad range of new visual experiences and are confronted with continuous change in their visual perspective; thus, they pay increased attention to environment (Mussen et al., 1990), and this then further stimulates their cognitive development. This illustrates the inseparability of domains.

However, understanding the contribution of each domain separately will facilitate awareness within this context. As endorsed by Ruth Griffiths (1970) in the construction of the Revised Extended Griffiths Scales of Mental Development (GSMD), development may be divided into the domains of physical and motor development, cognitive development, and socio-emotional development.

Development within these three domains is influenced by various factors. Children differentially experience the influences of culture, language, socio-economic status (SES), urban-rural residence, and experience their own unique genetic and health influences. These factors set the stage upon which development occurs. Within the context of this research the most prevalent factors effecting development are SES and HIV, exerting the most distinct influence on the shape of development of the sample group. Thus, when examining the development of children until three years of age these factors are also explored within the three domains of development.

3.4 Physical and Motor Development

Physical development is mostly orderly and predictable, and during the first years of life growth is particularly swift, with children typically tripling their weight and their height increasing by half (Feldman, 2002). Different parts of the body have their own period of rapid/slow growth, although growth in all parts of the body is continuous. Muscles and bones develop quickly during infancy. Bones become more interconnected and muscles grow in strength as their size increases. Physical growth follows cephalocaudal, proximodistal and orthogenetic principles. These are that development takes place from head-to-tail, from the centre outward, and that development starts off global and undifferentiated, and becomes differentiated with hierarchical integration (Sigelman & Rider, 2003). This can be seen in an infant hurling the whole body toward an object, while the toddler is able to reach and grab. These principles also apply to growth within the nervous system. Physical development, along with nervous system development is

particularly rapid before birth, leading up to the first three to four years after birth (Hurlock, 1981).

At birth infants have little control of their muscles and are born with a set of reflexes, which are unlearned involuntary responses to stimulus (Sigelman & Rider, 2003). The reflexes that are present are as follows (Kail & Cavanaugh, 2000, p. 85):

Table 4

Reflexes that a Newborn Infant Possess

Name	**Response**	**Significance**
Babinkski	Toes fan out when the sole of the foot is stroked from heel to toe	Perhaps a remnant of evolution
Blink	Eyes close in response to bright light or loud noise	Protects the eyes
Moro	Throws arms out and then inward in response to loud noise or when head falls	May help infant to cling to mother
Palmer	Grasps an object placed in palm of its hand	Precursor to voluntary grasping
Rooting	When cheek is stroked, it turns its head to the cheek that was stroked and opens its mouth	Helps infant find the nipple
Stepping	When held upright, and is moved forward, the infant begins stepping rhythmically	Precursor to voluntary walking
Sucking	Sucks when object is placed in its mouth	Permits feeding
Withdrawal	Withdraws its foot when sole is pricked with a pin	Protects infant from unpleasant stimulation

These reflexes are replaced by behaviours that become more complex as infants mature, and control of bodily movements develops. Muscular control is a co-ordinated activity of nerve centres, nerves and muscles. Such skills are learnt when the child is maturationally ready, thus the rate of motor

development depends on neural and muscular development. Increase coordination of muscles manifests in gross and fine motor skills. As these motor skills develop, speed, accuracy, strength, and economy of movements increase (Salkind, 1985).

The emergence of motor skills is closely related to perceptual-cognitive development. As children gain postural control of their trunks and heads and visual control of their eyes, they become increasingly skilful at reaching for and manipulating objects (Bartenthal & von Hofston, 1998). The perceptual skills that infants are born with allow for this, namely, they are able to pay attention to some stimuli, and ignore others, as they are attracted and held by contrast, movement, curvilinearity, colour, symmetry and many other qualities, especially that causes changes in the immediate visual field. Depth perception develops within the first few weeks of life, and visual acuity increases dramatically during the first few years. As children start to crawl and then walk, their visual-motor functions are particularly stimulated, and skills of reaching and grasping become refined. Fine motor development signifies the movement from reflexive activity to voluntary activity.

Neural maturation, physical growth, muscle strength, balance, and other characteristics interact with the environment. Children learn to move capably in their environment, and modify their movements to adapt to the environment.

Typically, infants are able to lift their chest at approximately two-and-a-half months, roll over by three months, and sit erect with support by four-and-a-half months, and without support by six months (Feldman, 2002). By this stage they have begun to use their hands together in a co-ordinated manner, and initial movements toward forward mobility can be noted. Generally by month eight they are able to crawl, and by month nine to 12 they are able to use their thumb and finger together, in a pincer grip, although somewhat ineffectively. By 12 months they can isolate their index finger. They are usually able to stand alone by 11.5 months, and by 13-15 months they take their first step. By 16 months fine motor skills have become more prominent; children can then scribble, and by the second year

can copy a horizontal or vertical line, or build a small tower with bricks, and may use one hand more frequently than another. By age three they can walk or run in a straight line, and their eye-hand co-ordination and control of small muscles is improving rapidly so that they can turn a page one at a time, unscrew a jar, and rotate a handle.

Reaction time improves as children mature. The speeding up of neural responses contributes to improved memory and cognitive skills. Finally, development is also affected by factors such as readiness to learn, opportunity and practice, models, guidance and motivation (Salkind, 1985).

3.5 The Effect of SES and HIV/AIDS on Physical Development

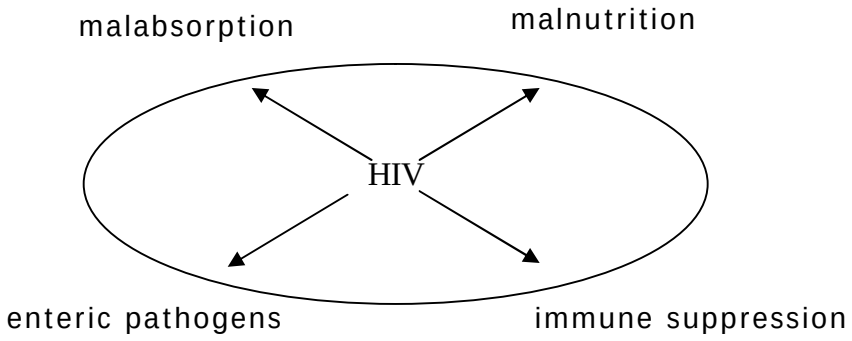
SES has a tremendous impact on the developing child. It encompasses factors such as parental income, educational level, and degree of literacy, parental occupation, quality of the neighbourhood, and community resources (González, 2001). The children who constitute the sample in the present study are of a lower SES. The effect of lower SES on a physical level may be examined particularly from a nutritional perspective, as the economic status of a household is known to be a strong determinant of nutritional status (Smith et al., 2004). It has been found that infants born to malnourished mothers are more likely to be smaller in size, and are at increased risk of poor growth and development (Gillespie, 1997). This makes them more vulnerable to infections in their first year, and more likely to develop serious developmental problems (Berg, 2000). Not only does malnutrition impact their in vitro development, but plays a pivotal role after birth. Lack of nutrition leads to a general retardation in growth (Sigelman & Rider, 2003). It may further be noticed in a lower body mass index, lower levels of energy and strength, and is hypothesised to negatively impact brain development. Children generally have a greater caloric and micronutrient requirement for their size than adults do (Church, 2000), and thus lower SES and malnutrition place children in a disadvantaged position for physical development.

SES may impact parental skills with regards to health behaviour, in a tendency towards apathy in acting on resources, and often a decreased awareness of resources that are available. Consequently, children may not receive the medical attention that they require when they are ill.

HIV/AIDS further places infants from a lower SES in a vulnerable position from a nutritional perspective. It is hypothesised that HIV may alter the gut barrier function and thus negatively influence the absorption of nutrients. There is a compelling association between deficiencies of nutrients with immune deficiency, HIV progression, and mortality (Singhal & Austin, 2002). Consequently, malnutrition is thought to be a co-factor in immune dysfunction (Singhal & Austin, 2002), and immunodeficiency may thus be induced through malnutrition or through HIV. The link between malabsorption, malnutrition and HIV infection may thus be diagrammatically presented in the following way (Singhal & Austin, 2002, p. 3):

Figure 2

Diagrammatical Link Between Malabsorption, Malnutrition HIV infection, and Enteric Pathogens



Enteric pathogens refer to pathogens found in the gut. As is evident, malnutrition, due to either lower SES or HIV culminates in a poor health status, and places children in a more vulnerable position to acquiring opportunistic illnesses, due to the interaction of these variables.

HIV infected children still advance through the normal sequences of milestones, however, as HIV compromises their natural maturational

progression they may develop at a slower rate than their peers at the same chronological age. Furthermore, phases of acute exacerbation within the disease progression often lead to a loss of developmental tasks that have just been mastered. As a wide range of signs and symptoms may be apparent (Allen & Vessey, 2004), however, from a motoric perspective, there may be a deterioration of motor skills culminating in progressive motor deficits, with children experiencing difficulties with control or coordination of body movements. This may be complicated by generalised weakness and gait disturbances (Belman, 1992).

Direct CNS infection leads to specific impairments, as opposed to generalised global delays caused by indirect HIV infection. As mentioned in Chapter 2, direct CNS infection occurs when the blood-brain barrier (BBB), a vascular barrier that protects the brain from penetration by infectious agents, is breached. The penetration of the BBB in a young child is a particular danger as it essentially only matures at birth, and thus is still vulnerable to harm during early development. Direct infection causes direct nervous system tissue damage, leading to a deterioration of functioning, depending on the localisation of tissue damage.

Motoric development has a broad impact on the child, influencing behaviour directly in practical limitations, and indirectly in effecting the child's attitudes (Hurlock, 1981). If physical and motor development does not occur age appropriately, other domains may be effected. For example, it may negatively impact the child's early social contacts, which are mainly in the form of play; the child may be excluded and thus deprived by fun and opportunities to learn through not being physically ready to participate. This then negatively impacts social development.

3.6 Cognitive Development

Cognitive development may be divided into the development of cognitive processes that include memory and planning, and language acquisition. These elements are mutually dependent, with milestones in cognitive

processes paving the way for progress in language development.

3.6.1 Cognitive processes

Cognition refers to the activity of knowing, and the processes through which knowledge is acquired and problems are solved (Sigelman & Rider, 2003). In young children cognition is observed through their behaviour, as processes and skills underlie behaviours (Bjorklund, 1995). As such, it is difficult to distinguish cognitive from motor development in children younger than 12 months (WHO, 1999). Children's immature cognition may be seen as progressive, becoming more complex over time. However, their immature cognition may also be seen as adaptive. For example, poorer perceptual abilities may protect the child from sensory overload, and slower information processing speed may protect the child from developing negative intellectual habits that would be detrimental later in life under different life conditions (Bjorklund & Green, 1992).

Two theorists who have made invaluable contributions to the understanding of the development of cognition are Piaget and Vygotsky. Here follows an outline of important facets of their theories.

3.6.1.1. Piaget

According to Piaget children understand the world through schemas, which are psychological structures that organise experience (Kail & Cavanaugh, 2000). Schemas change constantly, adapting to the child's experience. This intellectual adaptation involves two processes working together, namely assimilation and accommodation. Assimilation is the process of incorporating information into existing schemas, while accommodation is the process of changing a schema to incorporate new information. For example, the schemas for sucking and for arm movements are integrated and co-ordinated to form a thumb-sucking schema (Bjorklund, 1995). Through this complementary process knowledge is constructed.

Cognitive structures are altered through the incorporation of new information thus producing cognitive change, or development (Bjorklund, 1995).

Piaget identified four stages of cognitive development through which all individuals progress (Kail & Cavanaugh, 2000, p. 126).

Table 5

Piaget's Four Stages of Cognitive Development

Period	**Approximal age**
Sensorimotor	Birth to 2 years
Preoperations	2 to 7 years
Concrete operations	7 to 11 years
Formal operations	11 to 16 years

Movement from one stage of cognitive development to the next occurs when the child has reached an appropriate level of maturation in combination with exposure to relevant types of experiences (Feldman, 2002). The two stages that are relevant to the current research are sensorimotor and preoperations

In the sensorimotor stage, intelligence is limited to the exercise of reflexes, and as such is action based. More specifically, the infant's activities revolve around their own actions on the environment, and thus they chew, suck, shake, and manipulate objects. As they grow infants develop problem-solving skills but without using mental representation. Initially they have no awareness of objects or people that are not immediately present. When children develop object permanence, at between four to eight months, which is an awareness that objects and people exist even when out of sight (Sigelman & Rider, 2003), they can progress to symbolic thinking, as they are able to make a mental representation of an object or person. They are then able to distinguish themselves from the objects they act upon, and thus progress from action based to symbol based intelligence or representational

thinking has occurred.

During the preoperational stage intelligence is expressed in symbols via language and imagery, permitting children to mentally represent and compare objects out of immediate perception. Children develop internal representational systems that allow them to describe people, events, and feelings. Thinking is egocentric, in that children have a difficult time taking the perspective of another and view the world entirely from their own perspective. Thought is intuitive rather than logical, due to conclusions based on how things look as opposed to logical reasoning, or cause and effect conclusions based on unrelated facts that happened to be linked through time or space (Sigelman & Rider, 2003). Furthermore, children show an inability to understand the principle of conservation, which is knowledge that the quantity of a substance remains the same even though its shape or other aspects of its physical appearance might change.

3.6.1.2. Vygotsky

Vygotsky's theory may be applied at any age on the child's developmental spectrum. He believed that cognitive growth results when the child is exposed to information that falls within the zone of proximal development (ZPD). This is the level at which a child can almost comprehend a task alone. Skills outside the zone are either well mastered or still too difficult (Sigelman & Rider, 2003). Thus, learning is collaboration with more knowledgeable companions. Learning begins as a social process involving two people, and becomes a cognitive process in one, as the child develops skills and gains the ability to function intellectually independently when these skills are internalised.

As learning thus occurs in social interaction, it is also rooted in cultural and historical contexts, as these affect knowledge and thought patterns, and thus shape cognitive development (Sigelman & Rider, 2003). Vygotsky further believed that play is an important tool to moving children to more advanced levels of social and cognitive skills (Schróder, 2004).

3.6.2 Language acquisition

The acquisition of language occurs within the framework of the developing cognitive processes that have been explored. Speech involves the coordination of various teams of muscles of the vocal mechanism. It also requires sufficient mental preparation with associated meanings to the sounds produced (Salkind, 1985). Language itself is thus not just speech that is produced, but is the internal process that is used for thinking, and is vital to the way in which individuals accumulate knowledge. The crystallisation of concepts, the structuring of thought, and the communication of ideas are promoted by language (Kotras, 2003).

Language is an incredibly complex communication system made up of phonology, morphology, syntax, semantics, pragmatics and intonation (Sigelman & Rider, 2003), the rules of which children acquire in a remarkably short period of time. Accordingly, some theorists believe that there is a critical period for language acquisition and as such have proposed that children are genetically predisposed to pick up language, having an inborn mechanism for mastering language called the language acquisition device (LAD) directed at picking up the rules of language. This may be seen in the speed with which children pick up language, the fact that they progress through the same sequences at similar ages, and thus that there are universal aspects of early language development (Sigelman & Rider, 2003).

As children grow they are exposed to a particular language, and the sounds found within that language. Children develop language in the context of social interaction, acquiring reinforcement from their caregivers, as well as subtle corrective feedback. The more caregivers speak to their children, the more proficient they become (Feldman, 2002). Usually caregivers speak slowly and in exaggerated tones to infants, which help infants perceive sounds fundamental to the language (Kail & Cavanaugh, 2000).

During the first year and a half to two years of postnatal life until children use pre-speech forms of communication: crying, babbling, gestures

and emotional expressions. However, infants soon start cooing and babbling, and by 7 months their babbling includes intonation and varied pitch (Kail & Cavanaugh, 2000). Babbling thus becomes more complex and so developments in sounds production, combined with a young child's advanced ability to perceive speech sounds set the stage for the infants first true words (Kail & Cavanaugh, 2000). Comprehension is ahead of production in language development (Sigelman & Rider, 2003), however, children vary in age with the efficiency as which they use expressive language. By aged two children typically have a receptive vocabulary of a few hundred words. At this point they should be producing short sentences of two to three words, called telegraphic speech (Feldman, 2002). Their vocabulary grows rapidly through hearing others speak, with sentences growing longer. Sentences of 10 or more words are common in three-year olds speech. The grammatical morphemes or ending of words that make the sentence grammatically correct are gradually acquired during pre-school years. The acquisition of the basic rules of language should be complete by age five.

3.7 The Effect of SES and HIV/AIDS on Cognitive Development

Various factors effect a children's cognitive development, but particular contributors seem to be available educational resources along with the quality of the child's psychosocial rearing environment (González, 2001). SES directly affects these factors, not only in terms of income level and thus means to provide, but also in terms of time caregivers spend with their children, the level of stimulation they provide, their affective warmth and emotional health, and the quality of the physical environment (González, 2001).

The caregiver's ability to create a home environment of high quality is very individual, and may be understood as personal psychological factors interacting with SES (Bradley et al., 1994), such as their educational status, marital status, level of marital conflict, social class and income level (Wachs, 2004). Stress culminating from these factors can have a dehabilitating effect

in the carer's ability to focus on the stimulation of the development of their children.

Their ability to create this environment is critical as the quality of the child's early life environment plays a determining role in the child's level of brain stimulation and thus brain development (Najman et al., 2004). Consequently, it has been found that children from lower SES are generally at an increased risk scholastically, and show a higher tendency towards developing language delay (Johnson et al., 1989). Children have an increased tendency towards lower general ability (Moore, 1968), and towards attentional problems (Najman et al., 2004). Cognitive dysfunction is further hypothesised to be linked to inadequate nutritional status (Shor-Posner, 2004), which as previously noted is also prevalent within this population cohort.

The presence of HIV further impacts a child's cognitive development. Age influences the child's perception and response to the illness (Hymovich & Hagopian, 1992), although differences are based on the cognitive stage of development rather than merely on chronological age. HIV may limit an infant physically, in effecting mobility through physical impairment, diminished strength, fatigue or pain. The infant's learning is through sensory and motor experiences, and these factors may inhibit exploration and limit interaction with the environment, affecting the amount of information that is absorbed, and ultimately delaying development. As infants become toddlers, there ability to achieve is effected, and the acquisition of language and mental representations is slowed (Hymovich & Hagopian, 1992).

The delay of cognitive development may be affected through direct or indirect HIV infection. It is hypothesised that initial areas affected by HIV are subcortical and involve structures such as the basal ganglia, thalamus, pons, and brain stem (Moore, 2002). Functions connected to the basal ganglia include memory and cognitive flexibility (Lezak, 1995), and as such slowness in mental processing, forgetfulness, delays in cognitive flexibility have been noted. A decline in language comprehension is also prominent, and as HIV progresses perceptual abilities and executive functioning is

implicated (Moore et al., 2004).

There is some controversy concerning the onset of cognitive impairment. This is largely affected by the individual's age, stage of disease, and rate of disease progression. As the disease progresses and moves into AIDS, severe brain deterioration and eventually damage is evident.

3.8 Socio-emotional Development

Infants are born into an environment characterised by social-emotional relationships, the first of which develops with their primary caregiver, and lays the foundation for later relationships (Kail & Cavanaugh, 2000). As children grow they mature internally and are exposed to external societal demands, which create particular challenges to the individual at different stages of their life span. Erikson divided the life span into eight stages and believed that at each stage the individuals are required to resolve a crises or conflict which, when met successfully, equips them with a strength to carry on to the next stage (Feldman, 2002).

The first two stages identified by Erikson are applicable to the current research (Kail & Cavanaugh, 2000, p. 18).

Table 6

Erikson's first two developmental stages

Age	**Crises**	**Strength**
Infancy	Basic trust vs mistrust	Hope
1-3 years	Autonomy vs shame and doubt	Will

The first stage is based on the children's needs being met by their caregivers, and when this is done consistently, the children experience the environment as supportive and form strong attachment to their caregivers. At times their needs cannot be met therefore infants also concurrently learn

mistrust. With a proper balance between trust and mistrust infants can acquire hope, which is openness to new experience, although moderated by the caution that discomfort or danger may arise (Kail & Cavanaugh, 2000).

During the second stage children come to understand that they control their own actions, and thus develop a sense of autonomy in their ability to do things for themselves. Autonomy is countered by doubt that they will be able to handle demanding situations, and shame that may result from failure. A blend between autonomy, shame, and doubt gives rise to will, and the knowledge that within limits, they can act on their world intentionally (Kail & Cavanaugh, 2000).

These stages form the theoretical background against which children up until 36 months of age may be understood. Social and emotional development of children in this age range is now examined further in greater detail.

3.8.1 Social development

Infants are born with a bias towards certain moods and reaction styles that are called temperament (Mussen et al., 1990). Thus they have an innate tendency towards a predominant emotion which may affect the way in which caregivers interact with them. Thus the temperamental qualities of the infant and the practices, attitudes, and personality of the parents combine to produce a characteristic pattern of social interaction between the infant and caregiver (Mussen et al, 1990). This pattern is assumed to influence growth. Children interact with the environment around them, using the pattern that establishes between themselves and their caregiver to engage the world.

To engage the environment infants first develop an awareness of self. Thus, during the first six months of life the infant discovers properties of their physical selves, distinguishes between the self and the rest of the world, and by 18-24 months has an awareness of who they are. Development of the self is closely related to both cognitive development and social

interaction (Sigelman & Rider, 2003). Awareness of the self paves way for important social developments. Once the children are aware of themselves they are more able to coordinate their own perspectives with those of other individuals (Sigelman & Rider, 2003).

This then forms the foundation for their social interaction, which is initially egocentric play. Later play is used to engage in interactive relationships. As children grow their interactions become more frequent, sustained, more social and more complex. Play thus serves an important function in the socialisation process.

Play develops through various phases in sophistication, predominantly influenced by their cognitive development, and this serves many functions. Children learn social skills, patterns of effective interaction, and various social roles and rules are thought about, tested, and practiced. Play allows them to become more competent in interactions with others. They develop recognition and understanding in their ability to take on another's perspective and infer thoughts and feelings even when not directly expressed (Feldman, 2002). These abilities are central in social cognition, interaction and communication (Mussen et al., 1990). They develop the capacity to respond appropriately and learn physical and emotional control (Feldman, 2002). Furthermore, self-confidence and self-control increase (Mussen et al., 1990).

Initially, play observed with toddlers may be described as sensorimotor in that it involves sensorimotor responses which are functional with simple, repetitive muscle movements, for example, pouring sand through a funnel (Mussen et al., 1990). As children become less dependent on parents and more self-reliant they start to play more with toys, and by early pre-school they engage in solitary play. Here they play independently without concern of others. The next phase is parallel play where they play next to each other, although also independently. After age three they start to engage in associative play where they play together, but not in a co-ordinated manner, and this progresses to co-operative play where they interact to achieve a shared goal or take on different roles. As they develop cognitively their

ability to play with rules increases.

3.8.2 Emotional development

Emotion refers to conscious awareness of a specific change in internal feeling tone (Newcombe, 1996). Both perception and cognition, in combination with bodily changes, are inextricably entwined with emotion, affecting the experience of emotion. When examining emotion in children, cognitive development is particularly important as many emotions are allied to the emergence of related awareness. At the core of emotional development are the concept of self and the relationship of self to others (Karmel & Karmel, 1984). Only through awareness of self can children experience self-conscious emotions, for example, embarrassment.

Thus the development of the self is vital to the experience of emotion. This self develops through interaction with the primary caregiver(s), during which time infants emotionally attach to the caregiver(s). Another consequence of this interaction is that infants study emotional reactions and learn emotional responses from their caregivers. Furthermore, children spontaneously express emotion, for example, through laughing, and this elicits a positive response from the caregiver who then reinforces that expression. As children grow they learn to conform to social expectations and control overt expressions of fear, anger, jealousy, etc as they discover these expressions elicit unfavourable social evaluations of them (Hurlock, 1981). Thus while maturational factors are at work, emotional expression is also influenced by learning (Mussen et al., 1990), and the consequent emotional development is controlled by the combination of maturation and learning.

Infants are able to respond emotionally from birth with generalised excitement when stimulated. Soon reactions differentiate into pleasure and displeasure. As they grow their emotional reactions become less diffuse, with increasing linguistic and motor responses. Young children under a year have limited conscious awareness of their feelings and no thorough thought

process about the event of feeling elicited. Thus, their emotional reactions refer to changes in the brain and body and especially limbic and automatic nervous system. They are already able to express emotions similar to adults by a year (Hurlock, 1981).

By three to four months infants respond to unexpected surprises, and show distress, relaxation and excitement and are able to smile (Mussen et al., 1990). They show expressions of surprise and sadness by four months, and are able to laugh by the fifth month. Fear and anger may be expressed by five to seven months (Sigelman & Rider, 2003). By seven to 12 months they develop new fears, possibly due to improvement in their memory recall and working memory, seen for example in the emergence of separation anxiety, which decreases after two years of age when children have progressed cognitively and are able to predict the return of a parent. At six to eight months children show facial expression corresponding to shame and shyness, and it is only by the second year of life that self conscious emotions appear, such as the expression of contempt and guilt. By age three they can show consideration of the wants of their caregivers, as they are better able to regulate their emotions and have developed strategies in order to do so.

3.9 The Effect of SES and HIV/AIDS on Social-emotional Development

As indicated, infants and young children must learn to master developmental tasks related to early socialisation, developing trust in infancy through attachment and separation, and developing autonomy in pre-school years, through independent action (Hymovich & Hagopian, 1992). The impact of lower SES and/or HIV/AIDS during these early years can interfere with the mastering of any of these tasks.

SES effects the social and emotional development of the child through impacting the interaction of caregiver and child. Caregivers are affected by factors such as educational level, marital status, marital disruption,

unemployment (González, 2001), which along with economic difficulties, may create stress. The accumulative strain may interfere with the caregiver's nurturing ability (Hill & Sandfort, 1995). This nurturing ability is vital to the pattern of caring that is formed between caregiver and child. Psychological characteristics of the caregiver, in terms of academic and social skills, may mediate the effect of poverty in determining this pattern, however, for many within this population cohort, caring patterns are negatively impacted. Emotional distance of the caregiver is an example of the consequent pattern formed, which negatively impacts the child's attachment process.

As stated previously, individuals of low SES have a higher tendency towards malnutrition. Malnutrition may also interfere with emotional and social development as it is hypothesised that inadequate nutrition may cause disturbances in interactions with the caregiver; infants may be more passive, and their caregiver's less interactive, leading to them being less securely attached (Wachs, 2004). However, the social environmental conditions can have a buffering effect for children with histories of early nutritional deficiencies.

Children across all population cohorts engage in play. One of the functions of play for a child is that of social interaction, with play itself becoming more social in early childhood. Culturally approved environments, which adults create for children, influence the social aspects of play (Wachs, 2004). Children from a lower SES tend to be more exposed to negative or life threatening events. These events do not contribute to the development of a safe environment conducive to play, creating environmental stress that may negatively shape the learning that does take place. Consequently, children who face behavioural and emotional problems in their home environments are more likely to experience greater behavioural and emotional problems than other children (Vail, 2000).

The presence of HIV further impacts socio-emotional development. Caregivers may experience guilt, grief, or a chronically stressful environment that may negatively impact their ability to care. Furthermore, caregivers may be ill themselves, thus having less energy to care for an ill child. In such

circumstances caregivers may detach from the child emotionally, or start to view the child as vulnerable. These factors may inadvertently effect the child's development.

Infants with HIV are concerned with illness only as it directly interferes with their comfort (Allen & Vessey, 2004). Due to the physical discomfort that illness caused by HIV may produce, infants themselves may be less inclined to interact with their caregivers, and thus to attach. Also, the presence of opportunistic illnesses may require children to be hospitalised frequently, causing separations between child and caregiver. Learning to trust others can also be inhibited when children suffer frequent attacks on their body integrity, as may be a consequence of invasive medical procedures.

These factors, along with those associated with lower SES, may inhibit attachment and thus the development of a trusting relationship, the first developmental task children have. Disruption of the attachment process during its crucial stages may be critical as the child is put at risk to becoming detached or emotionally ungrounded and incapable of building relationships based on trust.

As children mature, they may start to explore more, in the process of developing autonomy. Children who are HIV positive may suffer from severe immuno-suppression. Consequently, they may require limits, being restricted, for example, in their play contacts. This is in direct contradiction to the developmental task at hand, as it enforces mandatory prolonged dependency, as opposed to encouraging autonomy, which in turn can make separation difficult (Allen & Vessey, 2004). It further defines illness for the child, as their understanding of illness is usually related to how the condition interferes with their desired activities. Children may themselves be less inclined to participate in play, due to their diminished strength, and consequently their progression through developmental tasks is further slowed.

During periods of acute illness behavioural regression may be evident. This is a means of social and emotional adaptation when psychic energy to

maintain functioning is unavailable; behavioural regression is exacerbated by the stress associated with fear, pain and other symptomatology. This may be further understood in children undergoing developmental transitions, as in this age cohort, having a decreased ability to tolerate other stresses and frustrations that might occur with a chronic illness (Hymovich & Hagopian, 1992).

Finally, the manner in which caregivers and other adults interact with the ill child may impact their emotional and social development. Children who are HIV positive or have AIDS may develop a physical disability, such as an awkward gait, as a consequence. Physical disabilities are often incorrectly associated with cognitive impairment, and thus interaction may occur in ways that disempower the child, break down their autonomy and contribute to a poor self-image.

3.10 Defining Developmental Assessment

Assessment is the process of gathering information for the purpose of making a decision (Wilderstrom, Mowder & Sandall, 1997). This goal requires evaluation of current and future functioning; the systematic use of a variety of special techniques aids this process, and facilitates the understanding of a given individual or group (Maloney & Ward, 1976). Once data has been collected and collated, it may be used in a variety of different ways. Accordingly to Meisels and Wiske (1993) these may include: identifying infants possibly as risk for developmental problems (screening); verifying the presence and severity of the potential problem (diagnosis); planning an appropriate environment, curriculum activities or other strategies to facilitate development (programme planning); and testing theories and hypotheses about various aspects of infant development (research).

The developmental assessment process should take into account the individual child and the context in which the child functions (Povey, 2002). SA has various cultural groupings, and due to the countries past political history, the socio-cultural and educational system for each group has

developed independently, the consequences of which are large cultural and educational discrepancies between population groupings (Kotras, 1998). Environmental conditions, to which children, particularly from lower socio-economic groupings are exposed, may also have a detrimental impact on their development. This may be seen in the research of Holt (1974) who emphasised that developmental delays may reflect the influence of adverse environmental circumstances, such as emotional abuse and child battering in general. Houston-McMillan (1997) further stated that many children function below their intellectual potential due to socio-cultural deprivation and understimulation. Griesel & Richter-Strydom (1993) concluded that there is high risk of developmental problems among many young South African children. Thus it is evident that assessing children's development is complex as it is affected by socio-economic and cultural factors.

Within the context of this study, assessment is geared at the evaluation of infants and children who are HIV positive or have AIDS, and is defined as a comprehensive psychological investigation that includes motor, socio-emotional and cognitive abilities (including language, memory, reasoning, and problem-solving), using direct observation, testing, medical reports, and biographical information (Alridge-Smith, Bidder, Gardner & Gray, 1980; Griffiths, 1984).

3.11 The Assessment Process in Early Intervention

Approaching assessment in a structured manner aids the evaluative process and best equips the assessor with the tools needed to derive the necessary information. This section aims at outlining a structured approach to assessment which may be useful in order to efficiently detect infants and young children in need of assistance, and intervene in the best way possible.

The following steps may be identified within this process: identification; screening; in-depth assessment; programme and intervention, and evaluation.

3.11.1 Identification

Identification refers to the process of locating infants, toddlers and pre-schoolers and their families who might be eligible (in need of assistance) for early intervention (Wilderstrom, Mowder & Sandall, 1997). Identification involves a variety of activities related to defining the target population, increasing public awareness of services, encouraging referrals and canvassing the community for children and facilities who may be in need of services (Peterson, 1997).

3.11.2 Screening

Screening is the process by which one or more children are assessed to identify them as needing a more comprehensive assessment. Brooks-Gunn (1990) identified the following characteristics as necessary for screening measures:

- the measure should be short.
- the measure should be designed for use in post-natal clinics, paediatrician's offices, community health services and outpatient hospital clinics.
- a variety of professionals should be able to administer the measure with a minimal amount of training.
- the measure should be geared to the constraints of busy clinical practice in order to ensure it will be used
- the measure should be constructed so that personnel would be discouraged from administering only parts of the measure (as this would reduce the validity and reliability of the measure).
- scoring systems should be simple and quick.
- the measure should minimise the number of false negatives, that is suspect children placed in a non-suspect group, as these children would not be retested.

During this phase the child's skills and abilities are examined to gain a broad understanding of his/her overall functioning. Screening points out developmental concerns through the analysis of patterns of peaks and lows, and thus identifies areas that require closer examination (Bondurant-Utz & Luciano, 1994).

3.11.3 In-depth assessment

In-depth assessment or diagnosis requires a comprehensive assessment to verify or identify the existence, severity, and nature of a disability or developmental delay, in order to plan appropriate interventions (Bondurant-Utz & Luciano, 1994). Diagnosis refers to the determination of the cause of a disorder or delay in order to prescribe treatment that would lead to a cure (Wilderstrom, Mowder & Sandall, 1997). During the screening phase, the cause of a developmental problem is still unknown or difficult to determine and appropriate interventions based on the cause cannot be planned. Thus the purpose of in-depth assessment is to provide more details, for diagnostic and intervention purposes. In-depth assessment should include (Bondurant-Utz & Luciano, 1994):

- a detailed and comprehensive analysis of child-development abilities that establishes the goal of intervention.
- a product, or score and, more importantly, qualitative information regarding the child's means and approach to earning that score.
- an outline of strengths and weaknesses with recommendations regarding the best way in which the child learns.
- an analysis of the child's development, focussing on the problem areas identified during the screening and the factors that impact on the developmental areas requiring intervention (Bondurant-Utz & Luciano, 1994).

3.11.4 Programming and intervention

Programming and intervention involves the determination of intervention objectives and outcomes, as well as the identification of useful intervention strategies in order to provide the services and support that the child and his or her family needs (Wilderstrom, Mowder & Sandall, 1997). Treatment options may include the planning of individualised activities, providing practical guidelines to parents, making appropriate referrals to other professionals, and planning adaptive strategies for teaching (Barnard, 2000).

3.11.5 Evaluation

Despite the support of multiple methods of data gathering in the in-depth assessment process, the importance of official and standardised assessment measures cannot be abandoned. The disadvantages of formal testing can outweigh the positive aspects under particular circumstances, such as (Povey, 2002):

- if the measures used are not standardised for the group on which they are applied
- if the measures used are not reliable and valid.
- if the measures used are not appropriate for the context and are not relevant for the problem being assessed.

3.12 Assessment Establishing Developmental Delay

After outlining the process of intervention, a deeper look at the purpose to intervention is need. The developmental assessment of infants and young children has been widely acknowledged as vital to the identification of developmental delays. Unobtrusive developmental variations and delays may be the first indication of serious conditions, which may have the result of interfering with the future development of the child, and may thus cause a lifetime of lowered untapped potential (Allan, Luiz & Foxcroft, 1992). If

delays are left unattended the original disabilities may become more severe and secondary disabilities such as emotional, social and serious cognitive problems may appear (Lister, 1981). Thus to optimise the child's development intervention should occur as early as possible, while presenting difficulties are still in their initial stages. Assisting children to overcome their difficulties by the early identification of deficits and delays is widely recognized as being of primary importance in assisting them to realise their potential (Luiz, 1994).

Holt (1979) comprehensively summarised the necessity for assessment in childhood in the following way: "Any child who is suspected of having a congenital defect or 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 (1979) 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) stressed that to measure the well-being of a child includes the assessment of physical, cognitive, social and emotional development. Thus, a comprehensive developmental assessment should include these four areas of functioning, which are not mutually exclusive. This is as "each aspect of development influences and is influenced by the others" (Edwards, 1992, p. 9). Therefore, a problem in one of these areas may effect the functioning of the others and as such is may be said that a deficit influences the child entirely. For example, a child who has delayed language development may as a result present with difficulties with social development being unable to communicate on the level of most other children of their age. Assisting the child by stimulation of language development may consequently help to improve their social development.

Thus, knowledge generated in assessment allows for the correct diagnosis of a delay or deficit, and assists in the construction of appropriate intervention programmes. Through informing the decision making process the best decision can be made in terms of support and resources for the child.

If developmental delays are detected at an early age, the cognitive deficit may disappear or at least improve over a period of time. Consequently, the need for an effective developmental assessment measure is vital to the early identification of possible developmental delays.

3.13 Issues Surrounding Assessment Measures

Assessing a child incorrectly because of an unreliable and/or invalid instrument, due to, for example, cultural bias, is just as dangerous, if not more dangerous than not assessing a child at all (Kotras, 1998, p. 2). It is therefore vitally important that the assessment measures used are valid, reliable and contemporary assessment instruments for young children. Assessment tools themselves are a product of a particular socio-cultural environment, and as such may be bias toward the culture from whence they came. Many assessment instruments focus only on a section of development, are standardised for specific ethnic groups to the exclusion of others, or are standardised for specific age groups to the exclusion of others and consequently have fragmented research backing and thus limited generalisability (Luiz, 1994). It is commonly accepted that no test is culture free. To make a measure more valid, reliable and contemporary the movement towards constructing tests that are culture fair has become prominent. Culture fair tests contain content based on experiences that are common to different cultures (Schróder, 2004).

Use of developmental assessment instruments in SA are widely debated due to the questionable reliability and validity surrounding assessment instruments that are applicable for use here. The development of a single valid, reliable test for the assessment of South African infants and children of all population groups is fraught with difficulties, particularly due to the

highly heterogeneous make-up of the South African population. Doing so would be particularly time consuming and costly (Foxcroft, 1985). Instead an alternative is to take an existing culture-fair test and to adapt it and standardise it for use in another culture. To do so would necessitate the test to be validated against local criteria namely, the culture in which the test is to be administered (Anastasi, 1982). To attain this assessment instruments need to be adapted for content and format, and standardised locally (WHO, 1999). This is where the GSMD have come to hold an important position, and may be seen as a test which attempts to fill the gap the currently exists in the developmental assessment of all young South African children.

Although the GSMD were developed and standardised in Britain, they are described as a "play" test (Houston-McMillan, 1997) as they contain items that are fun as they originate from activities rooted in natural conduct such as walking and talking. Consequently, they tap experiences common to different cultures, a characteristic which thus is particularly appealing within SA's multicultural context. Another noteworthy characteristic of the test is its ease of administration, being fairly flexible, and containing practice examples, all which lend itself to being more easily suitable for varied cultures, as opposed to tests with more rigid instructions.

The utilisation of the GSMD in areas as far a field as Columbia, a Third World Society (Cobos et al., 1971), is accredit to its application to various cultures. Much research has been examining its use with children from diverse backgrounds. Although there is much information that supports the GSMD as culture fair, South African authors (Allan, 1988, 1992; Bhamjee, 1991; Heimes, 1983; Luiz, 1994a; Luiz, Oelofsen, Stewart & Mitchell, 1995; Stewart, 1997; Tukulu, 1996) and international authors (Hanson, 1983; Hanson & Aldridge-Smith, 1982, 1987; Hanson, Aldridge-Smith & Hume, 1985; Huntley, 1994) have indicated several items as non-contemporaneous and culturally bias and thus in need of revision. Consequently, the GSMD has undergone revision, which was concluded in May 2004. Even so, the Griffiths Scales have proven to be a valuable tool and have been used effectively

within SA since 1977. It can be deduced that they may be used with confidence within this multicultural society.

3.14 Overview of Developmental Measures

Demand for developmental assessment measures that may be used with confidence with young children has been long recognised. Regardless of efforts made to meet this need, there are many limitations to the assessment measures that are currently used with young children. Within the valid developmental assessment of South African pre-school children, the following shortcomings are still evident (Allan, Luiz & Foxcroft, 1992):

- existing measures are not comprehensive, focusing on aspects of development or screening;
- tests are standardised for specific ethnic groups to the exclusion of others;
- specific tests are standardised for specific age groups to the exclusion of others; and
- due to specificity of tests regarding age ranges and ethnic groups related research is fragmented and limited in generalisability

Notwithstanding these stark shortcomings, the following section aims at exploring developmental measures that are currently used for developmental assessment of infants and children up until the age of three years, and evaluates them in terms of their usefulness in achieving their goal.

Developmental assessment measures may be described as either *screening* or *diagnostic* in nature. The goal of a screening instrument is to classify a child as at risk, or not at risk for a problem, while the aims of a diagnostic instrument is to identify the existence, nature, and severity of the problem (Kotras, 2003). As a result, screening measures generally give an overall view of the child's development, giving a qualitative description, while diagnostic measures provide information on specific areas of the child's functioning and supply a numerical score for each area assessed.

Assessment measures examined here are all diagnostic measures as these instruments are of greatest benefit to this population group. A further aim of this section is illustrating the context within which the GSMD are used.

3.14.1 Standford-Binet test (Standford-Binet scale)

These scales are used across the world to assess the intelligence of children and young adults aged two to 23 years of age. The scales came about in 1904 in France when Alfred Binet and Theophilus Simon were commissioned to design a test to identify children at risk intellectually. There have been various revisions of the test to improve its efficiency, with the most recent, the fourth edition, being published in 1986.

The new revision has been designed with a larger, more diverse, representative sample to minimise gender and racial inequalities.

Murphy and Davidshofer (1988) assert that the advantages held by the new version of the test include that for the first time a scale included a full theory of intelligence, the new version relied less heavily of verbal tests, thereby catering for individuals with verbal defects (an earlier criticisms had included heavy reliance on verbal participation). The term mental age had been removed, and IQ replaced by Standard Age Score (SAS), being seen as more accurate and less value-laden.

The Standford-Binet Scale tests intelligence across four areas: verbal reasoning; quantitative reasoning; abstract/visual reasoning; and short-term memory.

General reliability and validity of the test is reported to be high. However, there is strong evidence to suggest that the scale is less reliable for younger children especially in the age range of two and a half to five and a half years, as well as for children with very high SAS scores (i.e. above 140) (Murphy & Davidshofer, 1988). Furthermore, the test produces a general intelligence quotient, but no profile of strengths and weaknesses.

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

The Bayley Scales were developed in 1933 under the name of the California First Year Mental Scale. They were revised in 1969, but the modern revision and restandardisation was completed in 1993. The revised scales are used with children aged one month to 42 months. They measure mental and physical, emotional and social development, and in so doing are made up of three scales, namely, 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 (Schróder, 2004).

The BSID-II was designed to gain information about a wide variety of developmental abilities and the achievement of developmental milestones. Ultimately it aims at identifying children with cognitive or motor delay, and recommends forms of intervention. Anastasi (1982) considered the test construction procedures of the measure to be of a very high technical standard, with an average reliability coefficient of 0.88 being reported. More concurrent and construct validity studies are suggested on the revised scales, as well as further studies to investigate the scales' suitability with special populations (Barnard, 2000).

3.14.3 The Gesell Development Schedules (Gesell Schedules)

The Gesell Schedules were constructed in the 1940s to provide a standardised means of assessing patterns of behavioural development in children between the ages of one month and six years. They evaluate 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 (Schróder, 2004) with age placements determined by the percentage of children who pass each item. The reliability and validity of the Schedules are not considered sound, however, the scales have served as the foundation of many subsequent tests for infants and pre-school children (Brooks & Weinraub, 1976).

3.14.4 The Cattell Infant Scales (The Cattell Scales)

The Cattell Scales were heavily fed by the Gesell Schedules and assesses the mental development of children between two months and two and a half years of age by evaluating their motor control and verbalisations. Motor control is evaluated through a succession of tasks that entail manipulation of objects, during which the examiner takes notes on the child's communication endeavours (Schróder, 2004). Reliability and validity of the scales is questioned in literature (Brooks & Weinraub, 1976).

3.14.5 McCarthy Scales of Children's Abilities (McCarthy Scales)

The McCarthy Scales were published in 1972 to assess children aged two years six months to eight years six months in cognitive development and motor skills. The scales consist of 18 tests grouped into six subscales, namely: verbal, perceptual-performance, quantitative, general cognitive ability, memory and motor. It produces a General Cognitive Index (GCI) based on 15 of the 18 subtests, measures the child's functioning at the time of testing with no implications regarding immutability or aetiology. The McCarthy Scales are described as being well standardised with the caution that exceptional children, such as those who were either mentally retarded or gifted were excluded from the norm group (Povey, 2002). The measure

should be used with caution with children below five years who are mentally retarded or gifted as it is described as having an inadequate floor and ceiling (Nuttal, Romero & Kalesnik, 1992; Richter, Griesel & Rose, 1994). The Scales have been adapted for use in SA, normative information being available for various groups of children (Foxcroft & Roodt, 2001).

3.14.6 Non-verbal measures

Various non-verbal measures are used widely and in so doing have become prominent. The Vineland Social Maturity Scales (Vineland), (Doll, 1965) and Kaufman Assessment Battery for Children (K-ABC), (Kaufmann & Kaufmann, 1983) are two such measures that are suitable for use with children below three years of age.

The Vineland produces a score reflective of social competence as indicated by the caregiver's responses. The K-ABC is a measure of figural reasoning, with a starting age of two years six months.

3.14.7 The Extended Revised Griffiths Scales if Mental Development (GSMD)

The Griffiths Scales were compiled in 1954, and revised in 1986, to assess infants from birth to two years of age by Ruth Griffiths, and consisted of five scales measuring development in the following areas: locomotor, personal-social adjustment, hearing and speech, hand and eye co-ordination and performance. The scales, now known as the Infant Scales, were extended in 1970 to assess children aged birth to eight years of age, and in so doing a sixth scale was added measuring practical reasoning. The scales show high test-retest reliability and high general predictive validity (Povey, 2002).

The scales have recently been revised on order to make the items more current. As the focus of the study is on the Revised Extended Griffiths Scales

of Mental Development (GDMD), they are discussed in more detail in Chapter 4.

3.15 Chapter Overview

Infants and children who are HIV positive or have AIDS often show developmental delays or deficits that veer from the usual developmental path. Lower SES further complicates development, thus, intervening to assist children to best meet their potential through the stimulation of weaker areas is fundamental to promoting their growth and optimising their progress.

Thus, Chapter 3 has examined the development of the child within these circumstances by defining child development, and by examining its occurrence normally, as well as when influenced by the virus, and by SES, within the various domains of child development. Furthermore, it has defined developmental assessment, and provided an overview of various assessment measures that are widely used to assess the development of infants and young children.

Chapter 4 now explores the particular assessment tool used within the current study, namely, the GSMD. In so doing the background to the scales is given along with a description of the scales. Their standardisation is explored, as well as normative and clinical studies conducted that shed more light on their effectiveness. Finally, the revision of the scales is examined, and the process of restandardisation is explained, and research conducted with the new measure thusfar is explored.

Chapter 4
THE GRIFFITHS SCALES OF MENTAL DEVELOPMENT

4.1. Introduction

Chapter 3 addressed child development, investigating concepts important to understanding child development. Thereafter, it gave an overview of what theory says of the development of children until three years of age, within the various domains of development, and further looked at the impact of lower socio-economic backgrounds, and/or HIV/AIDS to the developmental pattern. Finally, the process of assessment, and the tools used to assess the development of children up until age three were examined.

Chapter 4 is devoted to the particular assessment tool used within the current study, the Revised Extended Griffiths Scales of Mental Development (GSMD). In so doing the background and description to the GSMD is given. The standardisation is explored, as well as normative and clinical studies conducted that illuminate the effectiveness of the scales. Finally, the revisions of the GSMD are examined, and the process of restandardisation is explained, and research conducted with the new measure is explored.

4.2. Griffiths Scales of Mental Development Introduction

Ruth Griffiths is one of the pioneers of the psychology of early childhood development, her name being synonymous with the concept ‘developmental assessment’ in much of the developed world (Allan, 1992). She developed the original Griffiths Scales of Mental Development, referred to as the Infant Scales, in Great Britain in 1954 as a diagnostic measure to assess the development of infants from birth to two years of age (Griffiths, 1954, 1970, 1984, 1986). These original scales were revised (Griffiths, 1960) and extended in the 1960s, to form the Revised Extended Griffiths Scales of Mental Development (GSMD), in order to assess children until the age of eight years four months.

Various research studies have been conducted on the GSMD, and can be

divided into two main domains, namely, clinical and technical studies. The focus of the present study is the assessment of a clinical group, namely infants and children who are HIV positive or have AIDS. Past research has highlighted the practical and diverse application of the GSMD, showing the GSMD to be useful in the clinical assessment and diagnosis of children from normal, as well as various special populations.

4.3. More about the Griffiths Scales

4.3.1. Background to the Griffiths Scales

The Griffiths Scales originated from an urgent need for an assessment tool that could be used with children for the early diagnosis of developmental delay.

To achieve this, a broad stance on development was taken in the formation of the scales. Griffiths paid particular attention to the inclusion of many speech items, where other infant scales had neglected to include such items. Items of a social nature were also included to measure the infant's emerging social skills. Furthermore, items that tapped physiological functions, such as sitting or pushing a pram, were incorporated as these were seen as the beginnings of mental development (Griffiths, 1960; 1970). This broad stance was particularly unique as most developmental tests focused almost exclusively on the cognitive development of the child

The test was thus made up of five scales, namely (A) Locomotor, (B) Personal-Social, (C) Hearing and Language, (D) Eye-Hand Co-ordination, and (E) Performance. The Infant Scales quickly grew in popularity, and consequently a revised and extended version of the scales was produced in 1970, maintaining the five main categories, and adding a sixth category, namely, (F) Practical Reasoning. This was to provide more comprehensive coverage of the young child's emerging problem-solving and logical reasoning skills (Griffiths, 1970). These six scales then formed the Revised Extended Griffiths Scales of Mental Development (GSMD). The IS was incorporated within the GSMD to measure development from birth to two

years of age, and thus the GSMD measures development from birth to eight years of age.

According to Griffiths (1970; 1984) five stringent criteria were used when developing the Griffiths Scales:

- the development of the Griffiths 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 observations test items came about.
- previous and existing test methods and tests were taken into account and items from noteworthy tests were included in the Griffiths Scales (e.g. Buhler, 1935; Gesell, 1925; Shirley, 1933).
- the Griffiths Scales had to fulfil stringent statistical requirements in terms of its reliability and validity.
- the Griffiths Scales took into account the special needs of both disabled and normal children.
- the Griffiths Scales were based on a study of (i) trends that appeared significant for mental growth, and (ii) the interrelations amid 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).

Items within the GSMD are placed in order of gradual increasing difficulty. They are criterion-referenced, meaning that that they may be used to determine an individual’s status with respect to an approved standard of performance (Kotras, 2001). Thus, participants are not compared to other individuals, but to some established criterion. Criterion-references tests measure on the basis of extremities, namely, the bottom of the scale indicating an absence of ability, while the top of the scale shows complete mastery of an ability, and may be particularly useful in determining the

degree of mastery with relation to the criterion being examined, and exceptionally so when examining behavioural objectives (Sattler, 1982).

4.3.2. Description of the Griffiths Scales

The individual scales that comprise the Griffiths Scales will now each be explored:

The Locomotor Subscale (A) provides the opportunity to observe certain physical weaknesses and disabilities, or more definite weaknesses of movement. Items include the ability to bounce and catch a ball, jumping over a rope, balancing on one leg and running indoors and out. At their particular age level, children are required to use physical strength, skill in speed and movement, and rhythm and poise. Finally, performance is affected by skills of concentration as well as emotional determination.

The Personal-Social Subscale (B) measures personal and social development. Items include the ability to dress and undress themselves, tie a knot, and give private information such as home address, birth date and family name. At a level compatible to their age, a degree of self-help is required from children in terms of personal cleanliness, efficiency at table etc, as well as a degree of social interaction and co-operation in play with other children. Emotional factors influence performance on all the subscales, but have a more definite effect on this scale.

The Hearing and Speech Subscale (C) taps the most intellectual abilities through the assessment of growth and development of receptive and expressive language. The subscale requires comprehension of language, verbal expression skills in terms of vocabulary and different parts of speech, as well as the use of sentences and paragraphs. Items include the naming of colours, description of the contents of a large picture, the naming of similarities and differences, the repetition of sentences with 6-16 syllables etc. Performance on this subscale is particularly affected by deafness or some degree of hearing loss.

The Eye and Hand Co-ordination Subscale (D) relates to items of

handwork and visual ability. Children are required to demonstrate manual dexterity, co-ordination between eyes and hands, careful work and persistence at a task. Items include the threading of beads, formal and informal drawings, writing and cutting of paper. Through these activities information may be gleaned about children's conception of space and form relations, and further information may be obtained about children's personalities from their drawings. The scales do not elucidate the interpretation and emotional significance of drawings, and are dependent on the clinician's own training in this area.

The Performance Subscale (E) involves performance-orientated tasks. In so doing it requires skills in manipulation, speed and precision of work, spatial perception and visual activity. Items include the building of stairs and bridges with blocks, completion of form boards and pattern making. Items correlate with those on the Hand and Eye Co-ordination Subscale in terms of the underlying skills of eye-hand co-ordination and manual dexterity of (D) being assumed and the focus is towards the application of these skills to new situations.

The Practical Reasoning Subscale (F) concentrates on the assessment of the most primitive indications of arithmetical comprehension, and the realisation of simple practical problems. Items include repetition of digits, counting, comparison of objects for size, length, weight etc. This scale requires children to reason about practical problems, and thus may be considered a predictor of school readiness in that it gives an indication of a child's ability to benefit from formal schooling.

4.4. Using the Griffiths Scales

4.4.1. The administration and scoring of the Griffiths Scales

The GSMD contain 468 items with two items per month for each of the five subscales from birth to 24 months, leading to a half month credit for each item. The third to eighth year contains six items for each year per

subscale, with two extra items for the ninth year per subscale, leading to two months credit for each item in each subscale. The items of each of the subscales are arranged sequentially in order of difficulty for each age group.

Test items that are to be administered begin approximately four months below the child's chronological age. A basal of six consecutive successes is required in each subscale. If a child fails any of the first six items in a subscale, earlier items are administered until a basal is reached of six consecutive passes. The items on each subscale should be administered until the child fails six consecutive items on the subscale. Administration is then discontinued, as this point represents the ceiling or 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 the items passed over the basal provides a separate mental age (MA) for every subscale. Developmental quotients are then calculated for every subscale by means of the following formula:

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

C.A. points to the child's chronological age in months and X represents the subscale for which the developmental quotient is being evaluated (Griffiths, 1984). The developmental quotients of the subscales were named by Griffiths (1984) as follows (Bhamjee, 1991, p. 52):

Table 7

Developmental Quotients of the Subscales of the Griffiths Scales

AQ	Locomotor Quotient
BQ	Personal-Social Quotient
CQ	Verbal Quotient (Hearing and Speech Scale)
DQ	Hand and Eye (Co-ordination) Quotient
EQ	Performance Quotient
FQ	Practical Quotient (known as Practical Reasoning)
GQ	General Intelligence Quotient

The General Quotient that represents General Intelligence is calculated by taking the average of the six individual scales of the child's total performance (Griffiths, 1984). Alternatively, for a quick overall assessment, the total number of items passed at each level, divided by three for children in years three to year eight, produces a mental age in months for each age group. Accordingly, the total items passed at each level divided by 10 for children below year three, as there are more items per scale for each age group below 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 on the rest of the subscales. The general formula is then applied to calculate the developmental quotients for each of the subscales, as well as for the G.Q. As each of the scales were standardised separately, they may be administered and scored separately (Griffiths, 1970).

Griffiths endeavoured to achieve an equal level of difficulty in each of the different subscales at each developmental level. She visually depicted the child's performance on the various subscales with the use of histograms, thus comparing subscale performance using the developmental quotient. Such a developmental profile clearly illustrates the individual child's range of abilities and relative disabilities (Griffiths, 1984).

The use of quotients instead of mental ages furthermore facilitates the comparison of children at different chronological ages, as well as the comparison of a child's performance at different times.

4.4.2. The interpretation and performance of the Griffiths Scales

Through studying the behaviour of individual children on the GSMD, Griffiths (1984) was able to identify general patterns of differences in development among children in terms of their general ability, as well as specific abilities. Children's performance on the various subscales may be graphically represented in numerous profiles that further add to the

interpretation of an individual child's performance. These profiles are constructed on developmental quotients to facilitate the comparison of profiles across various chronological ages.

Patterns that were identified were largely uneven and indicated differences in the level of performance on the various subscales. Main trends that were identified are as follows:

- children producing consistently low results on the Speech and Hearing Subscale (C) may possibly be suffering from a hearing or language impairment, or a lack of environmental stimulation. This low score may often be accompanied by low performance on the Practical Reasoning Subscale (F) and Personal-Social (B) Subscale.
- children producing consistently low scores on the Locomotor Subscale (A) and Hand and Eye Co-ordination (D) may possibly be suffering from a physical deficit or a degree of muscular weakness.
- children producing consistently low scores on the Personal-Social Subscale (B) may possibly be overprotected or socio-economically deprived, due to lack of exposure to learning about self-help activities that ensures their own personal care. Low scores may also be indicative of an unhappy or maladjusted child, as emotional factors feature more highly on the performance of this subscale than any other.
- children producing consistently low performance on all the subscales may possibly be suffering from a general developmental delay, with the level of performance indicating the degree of delay.

The developmental profile that results from the GSMD thus provides useful information for:

- identification of abilities and difficulties;
- decision on the necessity of further investigations
- the construction of treatment programmes for address skills deficits;
- the evaluation of the effect of treatment; and

- decisions about placement to further optimal development (Griffiths, 1970; 1984; Hall, 1971a; Hanson, 1982; Lister, 1981).

4.5. The Standardisation and Psychometric Properties of the Griffiths Scales

The standardisation of the original scales transpired by drawing upon a sample of 2260 children, from England, Scotland, and Wales, ranging in age from year one to year eight, and utilising this group for the development and extension of the GSMD (Griffiths, 1960). The constitution of the sample was as follows:

- approximately equal number of boys and girls
- 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);
- children from different institutions, for example, play centres and child guidance clinics; and
- 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-month age group, commencing with the first two months of the first year, and continuing to the 96th month. The final version of the GSMD had each item placed as near as possible to the point were it was passed by 50% of the children in a two-month age group. There was a progressive deterioration in the percentage of children passing the successive items in every scale, demonstrating that items in every subscale are arranged in order of increasing difficulty (Griffiths, 1960).

The mean quotients and standard deviations are depicted in the Table 8. The closeness of the mean to 100 and the standard deviation to 15 indicates that a normal distribution was attained for the standardised sample (Allan,

1988, p. 26).

Table 8

Mean Quotients and Standard Deviations of the Subscales of the Griffiths Scales

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

Within the standardisation process, Griffiths (1984) saw the main objective to be the standardisation of each scale as a separate entity that was valid in itself, and secondly to obtain equality of difficulty within the scales at each age level. Developmental quotients of each scale were normally distributed around the mean. The similarity of mean developmental quotients and standard deviations for the different scales signify that each scale may be considered as complete, separate and valid. The size of the mean developmental quotients provided further support for the conclusion that Griffiths achieved her main objective of complete, separate and valid scales (Allan, 1988).

When dividing the total number of items passed for each scale by the number of children in the sample, namely 2260, the approximate average of 48 items passed was produced for each child. This indicated a high degree of equality of difficulty on the various scales. This was further substantiated by the similarity of their mean developmental quotients and standard deviations. This equality of difficulty was further validated when examining the mean developmental quotients in every year grouping.

The GSMD were introduced to SA in 1977 and there are approximately 400 registered South African users to date (Shróder, 2004). The GSMD have been translated into Afrikaans (Allan, 1988) and Xhosa (Tukulu, 1996) using the Brislin (1976) back-translation technique. They have furthermore been administered on different South African cultural groups (Allan, 1992; Bhamjee, 1991; Kotras, 2001; Mothuloe, 1990). The Xhosa version of the GSMD was used for the present study.

4.6. Research Studies on the Original Infant Scales

Although the Infant Scales per say have not been employed in the present research, they form the basis of the birth to two age group of the GSMD. Thus, it is important to examine studies for which the Infant Scales have been used to gain a further understanding of their worth as an independent measure. The following studies have shown the value of the Infant Scales:

4.6.1. Correlations with other measures

The Baley Scales of Infant Development (Baley Scales) and the Infant Scales were administered to groups of high risk infants, profoundly multiple handicapped children and Down's syndrome children, and were compared and in some cases correlated (Beail, 1985; Ramsay & Fitzhardinge, 1977; Ramsay & Piper, 1980). The scores of the Infant Scales were significantly higher than those of the Baley Scales. However, significantly high positive correlations of between .73 and .96 were found, and gave an indication of the construct validity of the scales, meaning that that they assess the same underlying construct (Salkind, 1997). Thus it was concluded by the authors that although scores on the Infant Scales and Baley Scales are not interchangeable, performance on the one scale could be used as a reliable predictor for performance on the other.

Caldwell and Drachman (1964) compared and correlated scores from the Cattell Infant Intelligence Scale, a Composite Scale with items taken by the authors from the Gesell Scales and the Infant Scales. No significant difference between the scales was found, and high positive correlations of between .90 and .98 between the Infant Scales and the other scales with regards to mental age were produced, also indicating high construct validity of the scales.

Hindley (1960; 1965), Munro (1968) and Lister (1979) conducted longitudinal studies using the Griffiths scores at various ages and the Standford-Binet IQ scores at later ages. Significant positive correlations were generally found, however, the level of correlations were too small to make practical predictions among normal children.

Lister's sample consisted of children aged two to five years that were functioning below two years of age. Lister's findings gave evidence of predictive validity of the Infant Scales for developmentally impaired children, meaning the ability of the scale to predict a criterion. Furthermore, Lister's (1979) research promoted the value and significance of graphically depicted profiles.

4.6.2. Longitudinal studies

Various longitudinal studies were conducted with the Infant Scales. Hindley and Owen (1979) explored mental development from age six months to 17 years of age, while Moore (1967; 1968) examined language development and intelligence from six months of age to eight years. Spain (1970) conducted a survey on spina bifida, and compared the effect of various types of spina bifida on mental development, and Roberts (1970) examined neurological and developmental effects of common complications of pregnancy and birth. Finally, Robert and Rowley (1972) explored the association between quality of maternal care and infant development.

4.6.3. Comparative studies

The Infant Scales were used to compare the development of:

- full-term and premature babies (Roberts & Sedgley, 1965);
- asphyxiated and non-asphyxiated boys (Ucko, 1965);
- babies with different times of onset of in utero growth failure (Fancourt, Campbell, Harvey & Norman, 1976);
- babies with low and with full birth weight (Eaves, Nuttal, Klonoff & Dunn, 1970); and
- battered children with a control group (Smith & Hanson, 1974).

In most of these studies the researchers found significant differences between the groups.

The Infant Scales have also been used to evaluate the effectiveness of various programmes on the development of infants. Programmes that have been evaluated are the cognitive training for environmentally deprived infants (Lally, 1969); provision of a rich environment and warm nurse-child relationship for infants recovering from severe malnutrition (Yaktin & McLaren, 1970); increased stimulation for hospitalised malnourished children (Grantham-McGregor, Stewart, Powell & Schofield, 1979); perceptual-social stimulation for institutionalised infants (Brossard & Decarie, 1971); developmental training of potentially handicapped very young children (Cowan & Brenton, 1975); treatment of young phenylketonuria patients with a special diet (Woolf, Griffiths & Moncrieff, 1955; Woolf Griffiths, Moncrieff, Coates & Dillistone, 1958); training in the use of behaviour modification techniques and group counselling for the mothers of Down's syndrome children (Bidder, Byrant & Gray, 1975); and neurodevelopmental therapy for normal and at-risk survivors of neonatal intensive care (Goodman et al., 1985).

Within some of these programmes pre- and post programme scores of the experimental group were compared, while in others control groups were

utilised. Results generally indicated either significant change, or significant differences between experimental and control groups, or both.

Attwood (1978) used the Infant Scales to determine the age level of cognitively impaired children for the purpose of grouping together parents of children of similar levels of development for a workshop for parents. The Balvicar Child Development Centre for Pre-school Handicapped Children used a battery of tests including the Infant Scales as part of their initial screening procedure for all their patients (Hall, 1971a; 1971b). Oliver (1975) followed the development of three children through using the Infant Scales after they developed microcephaly and mental retardation following baby battering and shaking.

4.6.5. Item reliability

Hanson (1982) reported that tutors and trainees were concerned about the lack of technical data available on the scales, as well as the apparent subjectivity of various items. As a preliminary study to a revision of the scales, Hanson (1982) studied item reliability by examining the items of the Infant Scales, as well as the extra items of the GSMD. Findings revealed that overall reliability of the scales compared favourably with other tests of ability.

4.6.6. Comparison with standardisation sample

To further aid the revision of the scales, Hanson, Aldridge-Smith and Hume (1985) compared the performance of 447 normal British infants under the age of two tested in 1980 with Griffiths' original 1950 sample. The mean performance of the 1980 sample was approximately 10 points higher than the 1950 sample, with a mean G.Q. of 110,2 produced, which was significantly higher than the 99,7 of the standardisation sample. They suggested that environmental changes such as improved antenatal care and diet may contribute to the earlier emergence of abilities in infancy. They

recommended that clinicians refer to their findings for interpretation of individual assessments, until the restandardisation of the scales was completed (Allan, 1998).

4.7. Revision of the Infant Scales

Research thus indicated a need for the revision of the Infant Scales. The first phase of the revision was conducted by Huntley (1996), and culminated in the publication of the Revised Infant Scales (IS), which assesses children from birth to 24 months of age. Huntley aspired to preserve the original format of the scales, making changes only where they were necessary to update the scales in order for them to be more contemporaneous to the standards, expectations, behaviour and activities of infants in the modern world. In so doing Huntley developed an experimental version of the Infant Scales using original items, and supplementing new ones. The unique format of the Infant Scales was preserved, that is the five Subscales that are individually assessed and scored, and ultimately combine to provide a global assessment of an infant's development. Thus, as before, assessment culminates in Developmental (mental) ages and Sub- and General Quotients. However, the process of calculating these scores was simplified. Now also available are percentile equivalents of sub-quotients, as an additional means of expressing an infant's performance relative to the general population (Huntley, 1996).

As part of the revision process Huntley (1996) performed two field trials, N = 413 and N = 252 respectively with the experimental version of the Infant Scales. Item analysis procedures were completed after the first trial, producing levels of complexity and discrimination indices. On the basis of these results additional alterations to the experimental version were made, and thereafter the second trial was conducted. Samples from these two trials were combined to form a final revision sample, N = 650, that included children from different ethnic groups, both White and Non-White, as well as social class and geographic location. A new record book, scoring table, and

manual were published. The manual includes the instructions for the administration and scoring of the Scales (Huntley, 1996).

A unique feature of the GSMD is the way in which the IS is linked to the scales. As stated before, the GSMD are norm-referenced meaning that the items are placed in increasing order of difficulty. An infant may be assessed on the IS before 24 months, and reassessed on the GSMD after 24 months of age. The GSMD would include the original five subscales found in the IS, as well as the additional subscale assessing the developing Practical Reasoning skills. In this way the infant's performance may be compared against themselves longitudinally to determine changes in performance.

The revision of the manual for the IS does not include an extensive amount of technical detail. The manual for the GSMD expands on the technical data in more detail.

4.8. Research Studies on the Revised Extended Griffiths Scales of Mental Development (GSMD)

Research proving the clinical usefulness of the GSMD and continues to grow. Research utilising the GSMD has been conducted internationally in Canada (Ramsay & Fitzharding, 1977), Columbia, (Cobos, Roderques, & De Venegas, 1971), China (Collins, Jupp, Maberly, Morris & Eastman, 1987), Norway (Sletten, 1977) and also in Australia, Greece, Lebenon, the United States of America (USA). The GSMD have been widely used in SA since 1977, and have been successfully utilised on the diverse South African population.

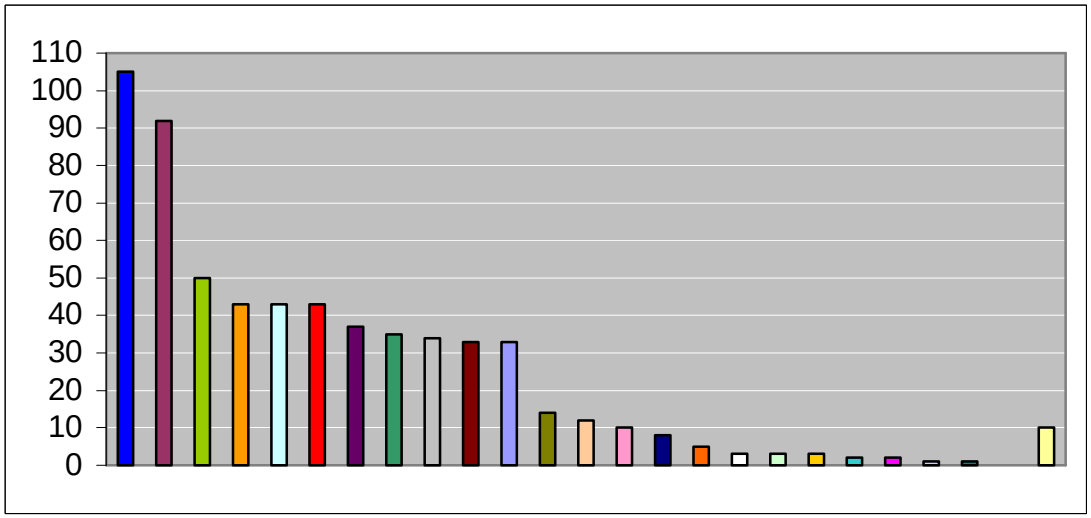
Early studies on the GSMD were case studies (Krige, 1988; Luiz, 1988a; 1988b) and correlation studies that examined the relationships between the GSMD and other assessment measures (e.g. Heimes, 1983; Lombard, 1989; Luiz, 1988c; Mothuloe, 1990; Worsfold, 1993). These studies preceded normative studies using larger samples of Black, White, Asian and Coloured children (e.g. Allan, 1988; 1992; Bhamjee, 1991), and were followed by various validity studies (e.g. Stewart, 1997; Luiz, Foxcroft & Stewart, 1999; Povey, 2002). Most recently, research has focused on the overall revision

process of the GSMD (e.g. Barnard, 2000; Kotras, 2003) to form the Griffiths Mental Development Scales–Extended Revised (GMDS-ER), and on the application of the GMDS-ER on clinical populations (Schróder, 2004).

Research using the GSMD can be divided broadly into clinical and normative studies. Research regarding its clinical use has shown the scales to be effective in clinical assessment and diagnosis of children from both clinical and normal population groups. Luiz et al., (1995) illustrated the diverse range of population groups with which the scales have been used.

Figure 3

Use of the GSMD for Various Problems



1	General developmental delay	13	Hearing Impairment
2	Delayed speech	14	Hydrocephalus
3	Environmental deprivation	15	Visual Impairment
4	Locomotor Delay	16	Spina Bifida
5	Behavioural Disturbance	17	Milestones
6	Eye and Hand Co-ordination	18	Phenylkelonoria
7	Down Syndrome	19	Learning problem
8	Clumsiness	20	Hypothyroidism
9	Cerebral Palsy	21	ADHD
10	Birth Complications	22	Encephalocele
11	Prematurity	23	Emotional
12	Convulsions	24	Hypercalcaemia
		25	Other

Research focusing on the technical properties of the GSMD has shown them to be a reliable and valid measuring instrument (e.g. Beail, 1985; Griffiths, 1984; 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 GSMD (Allan, 1998; 1992; Bhamjee, 1991).

4.8.1. Reliability studies

During the standardisation of the IS, a sample of N = 60 children were retested, with an interval of seven to 70 weeks between assessments, with the mean interval being 30 weeks. The test-retest reliability coefficient that was yielded was .87, and may be considered high.

During the standardisation of the GSMD, a sample of N = 270 children were retested, with an interval of three to 62 months between assessments. Children's ages ranged from the first to the seventh year of life. A test-retest reliability coefficient that was yielded was .77. Honzik, McFarlane and Allan (1966) found reliability coefficients of between .71 and .76 for test-retest periods of six to 12 months for a sample of three to five year-old children. These studies indicate that the GSMD are a stable measure of development (Barnard, 2000).

Aldridge-Smith et al. (1980) investigated the inter-rater reliability of the GSMD. Individual raters were asked to score a video recording of eight normal children, four boys and four girls of similar socio-economic backgrounds, who ranged in age from six months to seven years three months. The overall reliability level reported was found to be satisfactory, being .6 and 1.0 for 78% of the cases. The inter-rater reliability for the Hand and Eye Co-ordination (84%), the Performance (91%) and Practical Reasoning (95%) Subscales was greater than that found for Locomotor, Personal-Social and Hearing and Speech Subscales. Thus it was hypothesised that the latter three subscales may be more sensitive to interpretation and

that the small sample size, few scores and scoring based on the mother's report may be responsible for the lower inter-rater reliability on the later three subscales.

When reviewing the 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 (Schróder, 2004). It was further 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 (Aldridge-Smith et al., 1980). These findings have thus been addressed as part of the revision process of the GSMD.

A further study was conducted by Hansen (1982) that addressed reliability in terms of inter-observer agreement, in order to expand on the study by Aldridge-Smith et al. (1980). The sample comprised of N = 30 children who ranged in age from two months to seven years. Video recordings of Griffiths assessments were scored by five panels of nine or 10 trained Griffiths test users. Griffiths tests users disagreed on the scoring of one third of the test items (Hansen, 1982). This study further found high item agreement on the Practical Reasoning Subscale, but found similar levels of agreement/disagreement across the other five subscales. Of 303 of the 441 items examined, no disagreement occurred. On 21 items two panels disagreed, and on one item, one panel disagreed. Thus Hansen's study did not replicate the findings of Aldridge-Smith et al. (1980), and led Hansen to question the conclusions of their study. She criticised Aldridge-Smith et al.'s (1980) contention that a small sample, few scorers and scoring based on the mother's report, may be responsible for the discrepancies in terms of inter-observer agreement on the separate subscales (Povey, 2002). Hansen further encouraged written feedback regarding items that scorers had difficulties with, which were used to identify misleading and ambiguous items.

4.8.2. Validity studies

4.8.2.1. Correlations with other measures

Construct validity of the GSMD was initially determined by comparing the scales to the Termin-Merrill Scale (a revision of the Stanford-Binet). The Termin-Merrill test was administered to 524 of the 2260 children in the standardisation sample. The G.Q. obtained on the GSMD ranged from 99,45 to 101,92 for the different year groups, while the Termin-Merrill IQ ranged from 102,77 to 106,87. The correlation between G.Q. and I.Q. varied from ,79 to ,81 for the different year groups. Griffiths (1984) regarded this as an indication of a common factor in the different scales.

Studies by Beail (1985), Ramsay and Fitzhardinge (1977) and Ramsay and Piper (1980) have found high positive correlations of between $\underline{r}$ = .73 and $\underline{r}$ = .98 for the GSMD, Baley Scales and Catell Infant Intelligence Scales, and between the Catell and GSMD (Baley, 1969; Caldwell & Drachman, 1964).

Heimes (1983) examined the correlation between the GSMD and the Junior South African Intelligence Scale (JSAIS). The resulting finding was a high positive correlation, indicating that the tests assess the same construct (Heimes, 1983). Findings revealed positive correlations ranging between r = .43 and $\underline{r}$ = .81, that suggest that similar constructs are measured by the two tests. It must be noted that this study was conducted on a White South African sample, thus generalisation to the broader population in SA is limited.

The Griffiths Hearing and Speech Subscale (C) was compared with the Reynell Verbal Comprehension Scale (1977) by Luiz (1988c), in order to ascertain whether the assessment measures used examine different domains of development, or are related. Findings revealed no significant difference in the age scores of each range. A correlation of $\underline{r}$ = .92 was reported between the two scales, which is significantly high, although the paired comparison indicated that the two scales produced significantly different mean age

scores (Luiz, 1988c). This was understood as affected by the Hearing and Speech Subscale (C) of the GSMD measuring verbal comprehension and expressive language, while the Reynell Verbal Comprehension Scale measures verbal comprehension, or receptive language skills only.

Mothuloe (1990) explored the applicability of the GSMD to use with South African Setswana children, by assessing N = 45 Black Setswana-speaking children, and comparing the developmental quotients with that of the 1960 British standardisation sample. Mothuloe further investigated the influence of certain subject variables on their performance, and in so doing made a valuable contribution in translating the GSMD into Setswana. A significant positive relationship was found between the G.Q. of the GSMD, and the ASB total.

Furthermore, findings indicated that the scores of the Black South African sample were similar to that of the 1960 normative sample, while performances of other cultural groups have surpassed the 1960 sample. These findings would suggest that cultural groups do affect test performance. However, Allan (1992) and Bhamjee (1991) later reveal that socio-economic status is a significant factor influencing test performance and not cultural group.

Luiz, Fölsher and Lombard (1989) correlated the performance of N = 64 White South African children aged 5 and 6 years, on the School Readiness Evaluation by Trained Teachers (SETT) with the GSMD. Results showed a significant relationship between the total SETT score and the G.Q. of the GSMD for both English and Afrikaans language groups.

Tukulu (1996) correlated performance on the GSMD with performance on the Denver II, a screening measure, with Xhosa-speaking pre-school children. Findings promoted the GSMD as a relevant diagnostic measure for use with South African Xhosa-speaking children.

Povey (2002) examined the construct validity of the GSMD by studying the underlying dimensions tapping the six subscales. Age and cultural grouping was considered, and a factor analysis conducted accordingly. Conclusions asserted that barr the Performance subscale, all other subscales

tapped complex not single skills, and this suggests that more than one construct is tapped per subscale, all which vary with different age groups.

4.8.2.2. Intercorrelations and factorial validity

As part of the original standardisation process of the GSMD, interrelationships among the individual subscales were investigated. Thus quotients of each subscale were correlated with the General Quotient, with results showing positive and moderate correlations. Results were as follows (Griffiths, 1970, p. 72).

Table 9
Developmental Quotients of the Subscales correlated with the General Quotient (G.Q.)

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.

Griffiths (1970) concluded that a common factor of general intelligence is the foundation to each subscale. Although the Locomotor Subscale has the lowest correlation with the General Quotient, Griffiths included this subscale as it was seen as proving a measure of an important developmental domain. Subscales C, D, E and F show clear higher correlations and this was understood by Griffiths as providing an indication of the general intelligence factor or ‘g’, as described by Spearman (1923). She hypothesised that the

remaining variance could be accounted for by the specific factors or abilities that each scale professed to examine.

More recently, Luiz et al. (1999) studied the underlying dimensions of the GSMD using common factor analysis. A sample of N = 430 South African children between 54 and 83 months of age was used, consisting of White (N = 90), Coloured (N = 78), Asian (N = 167) and Black (N = 95) children. Data analysis of each group was conducted separately, whereafter the factor solutions were compared to determine whether the GSMD measured the same constructs for each group.

Furthermore, correlation coefficients obtained for the South African sample were compared with those of the British standardisation sample (Griffiths, 1970). It was found that the GSMD seem to measure one factor similar for White, Coloured, Asian and Black pre-school children (Luiz et al., 1999). Furthermore, a similar pattern of correlation was found for South African and British children, which indicates that the Scales are measuring a construct that is consistent across cultures and through time (Stewart, 1997; Luiz et al., 1999).

4.8.2.3. Predictive validity

Ludlow and Allen (1979) examined the predictive validity of the GSMD by correlating the performance of children with Downs Syndrome on the Revised Stanford-Binet Scales with the GSMD. Findings produced correlations ranging from r = .85 to r = .90, thus these positive correlations suggest that the measures assess similar constructs.

In order to investigate the predictive validity of the GSMD, Worsfold (1993) correlated the GSMD's G.Q. and its six subscales with the Grade 1 performance of N = 124 pre-school children aged five years six months to seven years. An equal numbers of boys and girls, as well as equal numbers of Black, White, Coloured and Asian children were included in the sample. Worsfold (1993) found a contingency coefficient of C = 0,51 between the Griffiths G.Q. and Grade 1 performance, and contingency coefficients

ranging from C = .22 and C = .44 for the six subscales and Grade 1 performance. All coefficients were statistically significant at the p - .05 alpha level. Findings showed that Griffiths profiles of participants fell into three scholastic groups, namely above average, average and below average, and differed significantly on subscales C, D, E and F. Results supported the predictive validity of the GSMD in predicting scholastic performance, and in identifying scholastically and developmentally “at-risk” children.

Conn’s (1993) study examined the performance of 107 children aged four years nought months to four years 11 months on the GSMD and compared their performance at the end of Grade 1 with these results. The product of this comparison revealed that the Griffiths results could be related to educational outcomes two or more years beyond the assessment, and thus supports the predictive validity of the GSMD in terms of educational outcomes at the age of seven years.

4.8.3. Case studies

Griffiths (1984) identified prominent patterns within development by studying the performance of a number of children on the GSMD. These patterns may be used for diagnostic purposes, and were explored earlier in this chapter. Krige (1988) examined the development of a physically disabled child by conducting a longitudinal study, assessing the child on the GSMD on four different instances. These were at 38 weeks, and at 26, 40 and 64 months. Through these assessments the child’s total potential with that of his age group was revealed, as well as highlighting his strengths and weaknesses. Thus, the GSMD allowed for the monitoring of the child’s progress, and facilitated a process of feedback to parents, which was valuable to the family system.

Luiz (1988b) performed an 18-month follow-up assessment with a child who had been assaulted. The child had been removed from an exceptionally poor and unstable home environment, due to abuse and neglect. The initial assessment was at age 31 months, at the time of placement in foster-care. A

second assessment on the GSMD, 18 months later, was useful in revealing the extent to which a child, previously from a destitute and volatile environment, could benefit from a caring and stimulating one.

4.8.4. Profile research

The clinical value and significance of using graphically depicted profiles was first recognised by Lister (1981). With the use of profile analysis a vulnerable child may be identified when compared with an established subtype profile. Areas of risk may be pointed out and applicable remediation can be prescribed. Through the identification of the child's strengths and weaknesses, insight into behaviour at home, school and social situations is facilitated. Thus, the child's needs may be considered more intimately.

Lister (1981) explored the developmental profile of N = 63 British children between the ages of two and seven years, who were assessed over the period of two years on the original GSMD. Lister (1981) verified the clinical usefulness of the developmental profile through describing case studies and presenting questions regarding the stability of profiles with regards to variables such as time, treatment and specific disabilities. These findings supported Griffiths' (1970) assertion that the GSMD may be used as a diagnostic tool.

Luiz (1988d) conducted a similar study to Lister (1981) using a sample of N = 93 South African children, and exploring the developmental profile of children aged two years six months to seven years seven months. Results were comparable to that of Lister (1981), and strengthened the resolve of the general effectiveness of the Griffiths developmental profile for White South African children.

Sweeney (1994) carried out a study to ascertain whether particular profile typologies could be established from the GSMD in the South African context. The sample was taken from a clinical database and comprised 198 children aged two years to three years 11 months (N = 43), and aged four years to six years (N = 155). Sweeney (1994) identified three clusters of

performance, namely high ability, average ability and low ability. Results also revealed that clinical typologies could be generated for South African pre-schoolers and early-schoolers.

4.8.5. Clinical research

Magongoa and Venter (2003) established developmental profiles of children with idiopathic tonic-clonic epilepsy through the use of the GSMD. Twenty-five children with tonic-clonic epilepsy, aged three to six and a half years, were compared with 25 children without epilepsy. The sample was matched according to age, sex, location and socio-economic status. Magongoa and Venter (2003) found that the children with epilepsy performed at a significantly lower level than the control group, although their performance was still mostly within the average range. The profiles for the two groups were similar, with children scoring the highest on the Locomotor Scale (A), and the lowest on the Performance Subscale (E).

Kotras (2001) conducted a study that explored the developmental profile of Black HIV positive children in the Eastern Province of SA, using the GSMD. The sample consisted of 75 infants in years one and two, from low socio-economic backgrounds, all of who were not receiving medication for the treatment of HIV. The sample's general performance could be described as low to below average. The mean G.Q., as well as the mean scores on each of the subscales, were lower for year two than for year one. The current research is a further investigation of this sample.

4.9. Recent Studies Highlighting Concerns

Recent studies have proposed that the population on which the GSMD were standardised may no longer be a contemporary representation (Allan, 1988; 1992; Hanson, Aldridge-Smith & Humes, 1985; Hanson & Aldridge-Smith, 1987; Huntley, 1996). Hanson and Aldridge-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. Findings revealed large increases in each of the subscales barr Eye and Hand Co-ordination. The researchers explained the changes in the Eye and Hand Co-ordination subscale (D) as being effected by the changes in educational policies and child rearing practices. Physical activities may be encouraged more than skills requiring quietness and concentration (Hanson & Aldridge-Smith, 1987).

Allan (1988) examined the suitability of the British 1960 norms for White South African children. Allan's sample consisted of N = 60 five year old English- and Afrikaans speaking White South African children. Results of the sample, as seen in Table 10 (Allan, 1988, p. 111).

Table 10

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

Significant differences were found on the G.Q. as well as on four of the six subscales (Locomotor, Personal-Social, Hearing and Speech and Performance). No significant difference was found when Allan (1988) compared the South African sample to a more contemporary British sample (Hanson & Aldridge-Smith, 1987). Furthermore, Allan (1988) investigated the subject variables of gender, language and socio-economic status, and

reported that socio-economic status was an important factor in test performance, with children from a higher socio-economic status performing better on the GSMD than those from middle and lower socio-economic status. The effect of socio-economic status on performance is a variable that needs to be taken into account in the present study.

Bhamjee (1991) conducted a similar study to that of Allan (1992) with N = 360 South African Indian children between the ages of three to eight years of age, comparing them to the 1960 British norms. Findings revealed that South African children performed better than British children based on 1960 norms, with respect to the G.Q. at each age level, as well as at least three of six subscales, namely, Personal-Social (B), Performance (E), and Practical Reasoning (F). Bhamjee (1991) found socio-economic status to be a significant factor influencing test performance with children from higher socio-economic status performing better than lower, as also found by Allan (1988) Heimes (1983), and Hindley (1960). Thus, the usefulness and appropriateness of using 1960 norms on South African children seems questionable.

In 1992 Allan extended her 1988 study and made a significant contribution to the body of knowledge on the appropriateness of the GSMD for use on South African pre-school children of all cultural groups. She compared the performance of 200 Black, Coloured, Indian and White five to six year old children on the GSMD, and further compared their performance to that of the British standardisation sample. In so doing she examined the influence of subject variables of gender, language and socio-economic status, and identified items on individual subscales as culturally loaded.

No significant differences for children from specific cultural groups were found with respect to the General Quotient (G.Q.), Hearing and Speech Subscale (C), Personal-Social Subscale (B), or Practical-Reasoning Subscale (F). On the other four subscales there were no significant differences between the performance of Coloured and Black groups, however, their performance did significantly differ from the Indian and White groups. Furthermore, there was a significant difference in performance of the Indian

and White groups on the latter four subscales. No significant difference was evident on the performance of English- and Afrikaans speaking Coloured children. However, the only subscale on which White English- speaking children scored significantly higher was the Hearing and Speech Subscale (C). It must be noted that this finding does not mean that the English and Xhosa versions of the GSMD are incomparable, as any study that explores the effect of language on test performance must consider the variable of culture.

Another variable effecting test performance on the Hearing and Speech Subscale (C) is the influence of the experiential world of the young urban child. Earlier research has shown that Black African children do not feel comfortable or familiar with pictorial representations (Biesheuvel, 1949; Minde & Kantor, 1976). It makes sense that children from various social and cultural groups are not equally familiar with some of the test items, which may impact on their test performance. Although Allan (1992) reported that Black and White children were highly comparable in terms of their parental education and occupational levels, the environment in which the Black child resides may be entirely different to that of the White child (Duminy, 1973). This study thus indicates that the significant differences found may be due to cultural and environmental factors, as opposed to the language of the translation of the test.

Individual items were furthermore examined and revealed a decreasing trend in the percentage of five and six year old children from each cultural group who passed successive items on individual scales. Each individual scale was examined, and Allan (1992) showed that item bias might hinder a national multicultural standardisation of the GSMD for South African children. British norms were shown to be applicable to South African White and Indian children, but not for Black and Coloured children.

South African studies have examined the influence of gender on performance on the GSMD. However, findings have been contradictory. Allan (1988) found no significant difference on performance. However, Mothuloe (1990) found Black girls to perform significantly better on the Locomotor

Subscale (A) than Black boys, an interesting finding given that boys are traditionally accepted as more advanced in this area of development. Bhamjee (1991) found that South African Indian girls performed better than South African Indian boys on the Personal-Social (B) Subscale. The contradictory nature of the above results may indicate cultural difference within the samples, which were drawn from different cultural groups. These findings are not conclusive and require greater exploration.

Huntley (1996) compared infants N = 665 living in urban areas to infants N = 177 living in rural areas on the GSMD. Results revealed that infants from rural areas scored significantly lower than infants from urban areas across all areas of development. The subscales that were most significantly affected were Personal-Social (B) and Hearing and Speech (C).

In drawing conclusions about the GSMD as an assessment measure it would seem that there is a high level of success in employing the GSMD to the assessment of infant and child development. Its comprehensive assessment provides information in the various domains of development. However, although the GSMD has much research backing, it is evident that using it inappropriately within a culture or socio-economic group for which it was not standardised may have a negative impact on the individual being assessed. Therefore, extensive research pointed toward the need for a revision of the scales.

4.10. The Revision and Re-standardisation of the Revised Extended Griffiths Scales of Mental Development (GSMD)

As is evident, extensive research has been conducted in support of the GSMD, however, research highlighted areas that needed revision to update the scales, as several items were indicated as culturally bias and ambiguous, and that the 1960 norms are no longer valid (Allan, 1988; 1992; Bhamjee, 1991; Heimes, 1983; Huntley, 1994; 1996; Luiz, 1994a; Luiz et al., 1995; Stewart, 1997; Tukulu, 1996).

In March 1994 the Association for Research in Infant and Child

Development (A.R.I.C.D.) held a conference in Manchester, England, as an introduction to the IS (Huntley, 1996). At the conference the need to expand and co-ordinate efforts to revise the GSMD was highlighted. Prof D.M. Luiz was appointed as co-ordinator of the project to revise and re-standardise the GSMD. A research proposal was submitted to the Executive Committee of the A.R.I.C.D. (Luiz, 1994b). The Executive Committee of A.R.I.C.D. accepted this proposal and in 1994 this considerable project was initiated.

The project commenced with a survey with a number of registered Griffith's users who regularly utilise the test, in which respondents were asked to evaluate whether items were good or poor (Luiz, 1994b). Based on these results it was evident that children as young as five years of age already began to achieve a ceiling on the scales. Furthermore, users of the GSMD highlighted items considered to be culturally bias and outdated.

As such, some items required modification and others were replaced completely. In response to each problematic item, possible new items were written, and experts in child development were asked to review them. The most superior items, along with old experimental items of the GSMD, were used for various rounds of pilot testing to South African children. Concurrently, a biographical questionnaire was completed that investigated each child's developmental history, socio-economic status, personal and social development, as well as a neurological checklist to screen for normal development. Thereafter, the new experimental version of the GSMD was submitted to the A.R.I.C.D. for comments and approval. After the experimental version of the GSMD was approved, the standardisation could be conducted.

The standardisation process of the GMDS-ER involved establishing new norms for the measure, and was the accountability of a team of international researchers. It was decided to conduct the standardisation process in the United Kingdom first, after which norms for other countries would be established.

Approximately 1100 children were tested within the United Kingdom, and the data generated was then used to complete the standardisation of the

GMDS-ER. The manual for the GMDS-ER was updated and includes instructions for new items, as well as additional scoring guidelines for items that have been modified. The final phase of updating the GMDS-ER was completed early in 2004 with the standardisation of the measure.

4.11 Research Conducted with the GMDS-ER

The GMDS-ER has been used in research that has examined its various technical aspects, as well as proving its usefulness on clinical populations. Kotras (2003) explored the Hearing and Speech Subscale (C), and provided evidence regarding its construct validity, and verifying a construct-model to enhance the clinical use of the subscale.

Knoesen (2003) assessed urban pre-school children to examine whether the GMDS-ER could be used to predict scholastic performance of Grade 1 learners. Results suggested that the GMDS-ER could be used to identify strengths and weaknesses in Grade 1 learners in the South African outcomes-based education system, and the study added value to using the scales to predict scholastic performance of Grade 1 learners.

Schróder (2004) explored the developmental profiles of hearing impaired pre-school children, and compared their performance to a sample of normal pre-school children, highlighting significant differences. Results indicated a mean G.Q. that fell within the average range, as with all the subscales barr Hearing and Speech (C) and Practical Reasoning (F), that fell within the below average range.

Currently there are various studies underway using the new measure. Van Rooyen is exploring and comparing the performance of normal South African children and British children. Baker is examining the development of a clinical population of pre-school and Grade 1 children diagnosed with ADHD. Makowem is conducting multiple case studies on a clinical population of pre-school children with cochlea implants, examining their development with the use of the GMDS-ER and archival records.

The GSMD have conclusively proven their worth as an assessment measure, showing high levels of success in the assessment of infants and children. The GMDS-ER have produced promising results thusfar. Given that this study examines development longitudinally, the use of the GSMD as opposed to the new GMDS-ER is validated. Problems in the GSMD that were highlighted in previous research are cushioned in that participants are compared to themselves in order to ascertain changes in their development. Given that extraneous variables are controlled as far as possible, as to be described in the following chapter, this allows for the use of the GSMD in the exploration of trends in the development of the participants.

4.12 Chapter Overview

This chapter had provided an overview of the background and development of the GSMD. Thereafter a description of the scales has followed, also exploring the administration, scoring and interpretation of the measure. The standardisation process as well as the psychometric properties of the measure is also examined. The clinical utility of the original Infant Scales was explored, followed by the revision process of the IS. Research involving the GSMD is investigated, as well as concerns that were highlighted through this research. Finally, a brief summarisation of the revision process of the GMDS-ER follows, as well as the standardisation process and research that has been conducted thusfar.

In summation, this chapter has illustrated the usefulness of the GSMD as an assessment measure in measuring the development of infants and pre-school children. The scales have been used in case studies, correlations studies, pilot normative studies and validity studies, and have played an indispensable role in the assessment of children in SA.

As stated, this study aims at using the GSMD as a measure to assess infants and children who are HIV positive or have AIDS. By collecting and analysing data on these children over a period of time, with the aim of identifying trends in their development that may be useful in working with

these children. Chapter 5 now formulates the problem and aims used to guide this research study. It explores the methodology applied by examining the research design, sampling methods, assessment measures, procedures, and data analysis methods that were employed, and finally reflects on the ethical considerations that were maintained within the investigation.

Chapter 5
RESEARCH METHODOLOGY

5.1 Introduction

Chapter 4 has presented a synopsis of the GSMD in terms of background, development and description. The administration, scoring and interpretation of the measure, as well as the standardisation process and psychometric properties have also been explored. The clinical utility of the original Infant Scales including the revision process in forming the Revised Infant Scales (IS) was looked at. The Revised Extended Griffiths Scales of Mental Development (GSMD) were examined in terms of research and consequent concerns that research has highlighted. Finally, a brief outline of the revision process of the GSMD, as well as the standardisation process and research conducted thus far was explored. Thus, the value of the GSMD as an assessment measure in the development of infants and children was presented.

The following chapter examines the aims and methodology employed in the present study. It formulates the problem and aims used to guide this research study, and explore the methodology applied by looking at the research design, sampling methods, assessment measures, procedures, and data analysis methods that were employed. Finally, it reflects on the ethical considerations that were maintained within the investigation.

5.2 Problem Formulation and Motivation for the Study

Chapter 2 centred on HIV/AIDS, exploring what this disease is, how it functions and spreads, its effects to date both globally and locally, its impact with regards to children, and its detection, and in so doing contextualised the disease under investigation. Chapter 3 conceptualised child development within which this phenomenon occurs, examining development when it occurs normally, and when influenced by HIV/AIDS,

and by socio-economic status (SES). This exploration occurred within the various domains of child development, namely, physical and motor, cognitive, and socio-emotional. The chapter then defined what assessment is, and examined ways in which child development is assessed, providing an overview of various assessment measures that are widely used to assess the development of infants and young children worldwide. This culminated in Chapter 4, in the description of the assessment tool used within the present research, namely the GSMD. Chapter 4 described the GSMD, explored the background, as well as the standardisation process, and normative and clinical studies conducted to assess the effectiveness of the scales. The revision process and restandardisation of the scales was also explored. It thus illustrated the usefulness of the scales as an assessment measure in measuring the development of infants and young children.

There has been limited research regarding the development of infants and children who are HIV positive or have AIDS, this despite SA being a country where a significant numbers are infected. It thus is an area of research that is increasingly being explored at present, in order to address the deficiency in knowledge. This study aimed at helping to add to the present body of knowledge regarding HIV/AIDS. Participants in this study were assessed in 2001, and at that assessment it was found that the mean general quotients and subquotients of each of the five subscales assessed were lower for infants in year two than those in year one (Kotras, 2001). Participants were assessed a second time, on average 11 months later, creating a broad view by examining the effect of the HIV (virus) on development over a period of time. The assessments generated knowledge about the participants' physical, cognitive, and personal-social growth, information that is valuable to parents, guardians, medical practitioners, teachers, care-givers, AIDS havens, and all others who are the minders of these children, and thereby the custodians of their health and welfare.

This research, having a developmental focus, was designed to enhance growth in equipping custodians with knowledge, through the demarcation of developmental areas that need attention. This is particularly important as

the numbers of infants and children surviving with HIV/AIDS is expected to increase in the foreseeable future, with ART being made available to all who are HIV positive, thus the effect of extension of life being expected. Based on the results of this study, therapeutic programmes could be developed to promote development through appropriate stimulation in weaker areas, by custodians or all those involved in minding the health and welfare of these children.

5.3 Primary Aims

The aim of this study was constructed to assist in addressing the dearth of information regarding the effect of HIV on the development of infants and young children over a period of time, within a South African context. Thus the primary aim was to explore and describe the developmental profiles of Black HIV positive/AIDS infants and children, from lower SES, aged three to 35 months over two assessments, in the Nelson Mandela Metropole, utilising the Revised Extended Griffiths Scales of Mental Development (GSMD). The six areas of general development assessed included: Locomotor, Personal-Social, Hearing and Speech, Eye – and Hand Co-ordination, Performance and Practical Reasoning.

5.4 Research Design

The research design used to achieve the aims of the present study may be described as quantitative, longitudinal, and exploratory-descriptive.

This study falls into the domain of quantitative research as the data that was collected was primarily numerical, as was the exploration thereof, using statistical techniques. This distinguishes the study from qualitative methods that would use primarily verbal data, thematic analysis, and individual interpretation (Bilkin & Bogden, 1992; Burns & Grove, 1993; Eaton, 2001). This study follows the exploration of the developmental profile of HIV infected infants and children conducted by Kotras in 2001, and is one

of the first studies of its kind to explore the development of HIV infected infants and children longitudinally.

The research may be described as longitudinal because participants were assessed at more than one point in time (Salkind, 1997). Longitudinal research provides more measurement of the variable under investigation, that of development, and is thus able to provide an increased amount of detail about the variable. Participants were all assessed twice, on either the IS or the IS and GSMD, depending on their age at the time of assessment, with an average of 11 months between the assessments. Subjects were their own controls in being tested twice, as each individual brought their own background and experience again, which then minimised intra-individual variability (Salkind, 1997), and thus increased the comparability of the data. Longitudinal research is a natural way to trace behavioural development (Achenbach, 1978), and within this context created a platform from which trends in developmental deficits could be observed.

A limitation to the longitudinal approach is the high attrition rate with the passage of time. The decrease in the sample size between the first and second assessment was significant, from 75 to 55. Disease progression of participants was not tempered through medication, as no participant was receiving ART. Thus, the decline in sample size, due to the nature of the disease in question, was predominantly owing to mortality of participants.

A further complicating factor in longitudinal research to be acknowledged is the nature of development itself, being continuously changing, which may cause difficulties in its measurement. However, the GSMD by design are criterion referenced, investigating the individual's status compared to a particular standard, which ranges from the absence of ability, to complete mastery of an ability. The measure thus provides a general quotient that makes development at various age levels comparable. In this way the changing nature of the variable under investigation is accommodated.

The research method may further be explained as exploratory descriptive. This method attempts to observe, record, and describe behaviour of interest (Davies, 2003). Behaviour of interest here was the

development of HIV positive/AIDS infants and children, for the purpose of generating knowledge about this population group. Descriptive research is used when exploring a relatively unknown research area (De Vos, Scurink & Strydom, 1998), and is usually the initial step in the exploration as it can lack depth. This restriction was well suited to the present study as this was an initial exploration within this relatively unknown research area. The advantage of the exploratory descriptive design is that it focuses on increasing knowledge of a particular field or construct, and in this way allows for the development of theory (Eaton, 2001).

With this focus in mind, no inferences or explanations were made and no research hypothesis was stated, for the reason that there is no way for controlling for all extraneous variable within a descriptive approach to research and thus no cause-and-effect conclusions can be drawn (McGuigan, 1990). However, an effort to control for extraneous variables that may confound results was made in order to minimise their impact on test performance and thus increase the confidence in results.

South African research on the GSMD has indicated that numerous variables such as culture, age and socio-economic status affect development and thereby test performance (Allan, 1988, 1992; Bhamjee, 1991; Hanson et al., 1985). Further variables that may impact test performance include gender, language and urban-rural residence. These variables needed to be acknowledged and attempts made to minimise their impact. Generally this can be achieved either by holding the extraneous variables constant or by building them into the research design (Graziano & Raulin, 2000).

Extraneous variables that were identified as exerting an influence within the present study were age, SES, language, urban-rural residence, gender and HIV diagnosis. The variables age, language, and urban-rural residence were controlled through the use of exclusion criteria, thus building them into the research design. Lower SES of participants in particular was verified through the inclusion of questions in the biographical questionnaire pertaining to caregiver's occupation, education, and family size, thus deducing SES of participants from their caregivers.

Gender was not controlled for. Previous research conducted by Allan (1998; 1992) with the GSMD showed that gender did not influence performance, barr differences found on the Personal-Social Subscale (B). Bhamjee (1991) found girls to perform better than boys on the same subscale (B), while Knoesen (2003) generally found that girls performed better than boys. African literature seems to indicate that boys are usually ahead of girls on most abilities (Irvine & Berry, 1988). Thus, South African research has proved contradictory regarding the influence of gender on performance on the GSMD.

The regulation of gender was complicated by the high attrition rate within the sample. At second assessment, approximately 33% of the sample was made up of girls, and 67% of boys. Thus, the unequal distribution of gender may be seen as a limitation to the research study.

Finally, the stage of HIV infection was not controlled for in this study. The disclosure of further information on HIV progression was complicated by confidentiality and logistical controls, which were insurmountable. This may be seen as an additional limitation.

The presence of further extraneous variables needs to be considered, although they are unknown. Further variables could not be controlled and may therefore be seen as a limitation to the study.

By acknowledging the potential shortcomings of the designs mentioned above, the researcher was sensitised to these limitations and interpreted findings within the constraints that they offer (Eaton, 2001).

5.5 Participants

5.5.1 Sampling procedure of the HIV positive/AIDS participants

Non-probability purposive and convenience sampling was used initially to identify participants for the study. The sampling method may be described as convenient as a requisite number of cases were conveniently available

(De Vos & Fouché, 1998), with participants being available for the research through their attendance of an HIV support group run at the Dora Nginza Hospital. Caregivers of participants were referred to the support group after HIV diagnosis at the Kwazakhele Day Clinic, the Dora Nginza Hospital or the Livingstone Hospital, which they attended for their medical concerns. During the second assessment of the participants sampling could not be described as convenient as these particular participants needed to be identified and re-assessed; this could then described as non-probability purposive sampling.

In non-probability sampling the likelihood of selecting any one member from the population is not known (Salkind, 1997), therefore, the sample cannot be said to be representative of the broader population, and consequently knowledge generated cannot be generalised to the broader population. Given the descriptive nature of the study, this limitation was not problematic, as the study was exploring a relatively new research area. Benefits of this sampling method are the ease of its administration and its cost effectiveness.

The sampling method can finally be described as purposive, as the sample was based entirely on the judgement of the researcher, and was composed of elements that contain particular attributes of the population (De Vos & Fouché, 1998). Purposive sampling, as applied to this study, was seen in the researcher's judgement being used to choose participants that met the exclusion criteria, to be described below.

5.5.2 Description of the HIV positive/AIDS sample

The total sample to be included in the present study consisted of 55 Xhosa-speaking, Black South African children of lower socio-economic status, living in the urban area of Kwazakhele in Nelson Mandela Metropole. They were aged between three and 35 months across the assessments, had a positive medical diagnosis of HIV or AIDS, and attended either the Kwazakhele Day clinic, Dora Nginza Hospital and Livingstone Hospital for

medical concerns. Participants were included in the sample only if they met these exclusion criteria. The participants HIV positive and AIDS status was defined as:

- perinatally or postnatally infected by HIV
- diagnosis made by a medical practitioner; and
- excluding children in the fulminant stage.

75 Xhosa-speaking participants were assessed in 2001 on the IS or the IS and GSMD. Participants were then aged between three and 24 months, and thus were in years one and two. The sample consisted of 48 boys and 26 girls. Due to attrition within the sample, which was predominantly due to mortality of participants, only participants who were assessed twice were included in the sample for the present study. 55 participants were assessed for a second time, who ranged between 13 and 35 months in age, and were thus in years two and three. They consisted of 19 girls and 36 boys. The sample size decreased from 75 to 55 participants.

The majority of caregivers of the participants identified themselves as HIV positive, and thus participants themselves were tested to confirm their own HIV status. Testing was carried out by medical practitioners at the various medical institutions. Nursing sisters were involved with pre- and post testing counselling of caregivers. Caregivers were referred to a HIV support group run at the Dora Nginza Hospital by a social worker at the hospital after diagnosis, from whence the participants in the study were located.

At their first assessment participants had thus been identified as HIV positive, a criteria for inclusion in the sample. At second assessment HIV progression was not assessed, thus an AIDS diagnosis was not an exclusion criteria. Thereby the amount of participants who were HIV positive, and those who held an AIDS diagnosis is not known.

5.6 Assessment Measures

5.6.1 Revised Extended Griffiths Scales of Mental Development (GSMD)

The Xhosa translation of the GSMD was administered to participants. Chapter 4 entails a thorough description of the scales.

The GSMD has been assessed psychometrically, and the overall psychometric properties were found to be satisfactory. Research pertaining to these investigations is also cited in Chapter 4.

5.6.2 Biographical questionnaire

Various factors may contribute to the formation of developmental differences and delays, and as such may be related to biology or to the environment or both (Lister, 1992). Such factors may influence the participant's test performance.

A questionnaire is used to obtain information about phenomenon (De Vos & Fouché, 1998), and in this context it was used to obtain information about these factors or extraneous variables that could influence development and thereby test performance. The biographical questionnaire gathered information from caregiver(s) regarding participant's birth history, living conditions, physical, mental, behavioural and social development, medical history (including HIV status), and the SES of caregiver(s). The psychologists who were involved in the study assisted caregivers with the completion of the questionnaire. This occurred at the beginning of each test session. Assessments were conducted in Xhosa to maximise understanding, both in the assistance of caregiver(s) with the biographical questionnaire, and in the assessment of participants on the GSMD. The questionnaire used is attached in Appendix B.

5.7 Procedure

Prof D.M. Luiz of the Nelson Mandela Metropolitan University (NMMU) initiated the research study. She contacted with the following individuals, explaining the purpose of the study and the methodology that would be used to conduct it; their permission was gained to do so:

- Chairperson of The Kwazakhele Health and Welfare Forum,
- Senior Nursing Manager of the Kwazakhele Day Hospital,
- Medical Superintendent of Dora Nginza Hospital,
- Medical Superintendent of Livingstone Hospital,
- Senior Nursing Manager at the Paediatric HIV clinic at Dora Nginza Hospital, and
- The Ethics Committee of the NMMU.

Permission was acquired to conduct a longitudinal study, and thereby this permission was valid for both the first and second assessments.

Initially, the following procedure was carried out to reach the aims of the study:

- a lay, Xhosa-speaking field worker, involved in administrative work at the NMMU, was contacted by Prof Luiz to carry out the organisational aspects of the study.
- two registered Xhosa-speaking psychologists in the Nelson Mandela Metropole who are registered Griffiths users, were contacted by Prof Luiz to conduct the assessments.
- Prof Luiz linked the psychologists and the field worker to the Dora Nginza Hospital, where caregivers of HIV positive/AIDS infants and children met for an HIV support group.
- caregiver(s) of the identified HIV positive/AIDS infants and children who attended the HIV support group were approached by the psychologists at a group meeting, and the proposed study was explained to them. Their written permission was gained to assess their children.

- the psychologists contacted caregiver(s) and set up appointments at times that were convenient for the caregiver(s) and children.
- the children were assessed on the Xhosa version of the Revised Extended Griffiths Scales of Mental Development (GSMD) at the outpatients clinic of the Dora Nginza Hospital. Caregiver(s) were informed of what the testing process would entail.
- the psychologists scored the protocols.
- the protocols were returned to the 'Griffiths team' for checking of scoring, data capturing and analysis.
- the psychologists wrote individual reports on each child assessed on the GSMD and these were sent to the respective caregiver(s).
- verbal feedback was given to the caregivers(s) at a work-shop held in the Kwazakhele Community.
- feedback was given to the local authorities.

At the second assessment, this procedure was repeated. However, at this assessment the vast majority of testing took place within the homes of participants. Tracing participants did lead to logistical difficulties in some cases, as some participants and their caregiver(s) had relocated and tracking their where abouts was time consuming, and occasionally unsuccessful.

5.8 Data Analysis

5.8.1 Descriptive statistics

Data was analysed to meet the aims of the study, in describing and exploring the development of HIV positive/AIDS infants and young children. Descriptive statistics were used to describe the distribution of scores (Salkind, 1997), as they organise and summarise observations so that they are easier to comprehend (Minium et al., 1993). Descriptive statistics employed to do so were measures of central tendency (mode, median, mean), which provide information that is representative of the distribution of

scores (Salkind, 1997), as well as measures of variation (range, variance, standard deviation) which indicate the dispersion of scores around the mean (De Vos & Fouché, 1998).

These statistics then described the performance of participants on the various subscales, as well as at the level of general quotients. Performance on the subscales were graphically depicted using average subquotients. Descriptive statistics were also used to summarise the biographical details of the sample.

A Hotelings-T^2 test was used to compare the profile of participants between the two assessments, and provide information regarding ways in which the subscales differed between these assessments. A Hotelings-T^2 test compares the profiles of two groups when multiple comparisons need to be undertaken and thus a type I error needs to be minimized (Hair, Anderson, Tatham, & Black, 1995; Harris, 1998; Davies, 2003). In so doing the Hotelings-T^2 compared, through the use of one test, the performance of participants in both assessments on the six subscales. Results then indicate the significance of the difference between performances.

5.9 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 examination of the ethical principles that were upheld throughout the research study ensues.

5.9.1 Respect and dignity

The primary concern for health research involving human participants should be respect for individuals. This is a fundamental premise as all individuals require and merit respect. Factors to consider in imparting this respect include language, beliefs, culture, customs and perceptions (Ethics

in Health Research in South Africa, 2000). Respect for participants was upheld through an awareness of these factors.

5.9.2 Informed consent

Clients are required to give consent to participate in research, and in order for this consent to be informed need to have knowledge of all aspects of the research. This includes the procedures to be followed and a description of possibly adverse results from participating (Christensen, 1997). This explanation should occur in language that they can understand. Since participants were minors this process was carried out with the caregivers of participants. Their permission for their charges to participate in the research was gained in writing. Participants were free to withdraw their involvement at any time, and this was conveyed to their caregivers.

5.9.3 Investigator competence

The two parameters on which a researcher's competence is assessed are technical and humanistic (Ethics in Health Research in South Africa, 2000). Technical competencies refer to competencies surrounding training and experience, while humanistic competencies refer to competencies of sensitivity and compassion in interaction. Researchers chosen to conduct the testing were deemed competent in these areas as proven in their skill in child development theory and assessment in the completion of a masters degree in psychology. They furthermore received additional training in the administration of the GSMD and thereby qualified as registered users.

5.9.4 Beneficence and non-maleficence

Beneficence is the principle of promoting health and welfare by preventing harmful consequences, removing harmful conditions and positively benefiting to others. Non-maleficence is the principle of not doing

any harm (Steere, 1984). The difference between these duties follows an intuitive division between actively doing good and, more passively, refraining from causing or increasing harm to others (King & Churchill, 2000). When the study was examined according to these principles, it was deemed that individuals involved in the study upheld these principles.

5.9.5 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 development needs, as well as to the real needs to those suffering from the concerns and diseases being studied. The present study is relevant, as outlined in Chapter 2, and information generated is particularly applicable and sorely needed to meet the dearth of knowledge in this area.

5.9.6 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 is underlined by a sound research methodology, is as free as possible of unexamined assumptions, is meticulously carried out by qualified researchers and is contextualised by relevant research in the area (King & Churchill, 2000). Furthermore it provides descriptions in the research area that it proposes to examine.

5.9.7 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 are 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). After the data had been analysed, feedback was given to the guardians of participants. Furthermore, the findings of this research study will be made available to the NMMU library in the form of a treatise.

5.9.8 Ethical review

All health research conducted in SA must be reviewed by an ethics committee and may only proceed once the committee has given its approval (Ethics in Health Research in South Africa, 2000). An application was made to the NMMU Ethics Committee and their permission granted for this study to proceed.

5.10 Chapter Overview

As stated, this chapter presented the problem formulation and aims of the research, and gave a summary of the research methodology identified to achieve this. It investigated the exploratory descriptive design, and non-probability and convenience sampling methods used to explore the development of HIV positive/AIDS infants and children using the GSMD. Furthermore, it has explored the procedure that was followed, as well as the data analysis techniques that were used to do so. Finally, it has examined ethical considerations that were maintained within the investigation.

The primary aim of the study was to explore and describe the developmental profiles of Black HIV positive/AIDS infants and children, from lower SES, aged 3 to 35 months over two assessments, in Nelson Mandela Metropole, utilising the Revised Extended Griffiths Scales of Mental Development (GSMD). The six areas of general development assessed included: Locomotor, Personal-Social, Hearing and Speech, Eye –and Hand Co-ordination, Performance and Practical Reasoning.

Chapter 6 now examines the results of the study. It uses descriptive statistics to explore the findings of the biographical information, and

examines the performance of participants at the level of general quotient, and subscales, across assessments, as well as across year groupings.

Chapter 6
RESULTS AND DISCUSSION

6.1 Introduction

Chapter 5 formulates the problem and aims used to guide this research study. It further explores the methodology applied by looking at the research design, sampling methods, assessment measures, procedures, and data analysis methods that were employed, and finally reflects on the ethical considerations that were maintained within the investigation. Chapter 6 now explores and describes the findings of the study.

The empirical findings of the primary objectives of the study are presented and discussed below. Descriptive statistics in terms of frequencies and percentages were used to summarise the biographical information of participants, including information describing SES based on parental employment, education and family size, as well as participants' gender, age, and weight at first assessment, and various questions aimed at detecting extraneous variable that may contribute to the formation of developmental delay.

Descriptive statistics in terms of measures of central tendency (e.g., mean and median) and measures of variability (e.g., standard deviation) were used to summarise the general performance and profile of the sample of participants with HIV/AIDS (n=55). Statistics are presented to depict the performance of participants on the six subscales making up the GSMD, as well as the general quotient, for both the first and second assessment. The profile of the general performance of the sample on assessment one and two were compared using a Hotelings-T^2 test. Participants were furthermore divided into two sub-groups according to the average time between assessments, namely nine to 10 months and 11 to 15 months, and performance at assessment one and two was again compared using a Hotelings-T^2 test. These results are discussed where they contribute significantly to the general performance of the sample. Finally, the

participants in the general sample were divided into separate groups according to their year level at assessments, and descriptive statistics are presented to depict the performance of participants per year level both for the G.Q., and for the individual subscales. It should be noted that norms for South African children with HIV/AIDS are not currently available for the GSMD and thus results should be interpreted with caution.

6.2 Biographical Information

Descriptive statistics, using frequencies and percentages, were used to summarise the biographical information of participants, including information describing SES based on parental employment, education and family size, as well as participants' age, gender, and weight at first assessment, and various questions used to detect extraneous variable that may contribute to the formation of developmental delay. The questionnaire used to gather this information may be seen in Appendix B.

6.2.1 Socio-economic status (SES)

There is much research to substantiate the influence of SES on developmental performance, as has been explored in Chapter 3. Originating from a family of origin from lower SES was one of the inclusion criteria stipulated for all participants in the sample. SES was explored by investigating parental employment, education and family size, although marital status was not investigated.

Information gathered revealed that no female caregivers within the sample were employed. 31 percent of male caregivers were employed, all being blue collar workers, employed for example as labourers, security guards, taxi drivers and cleaners. A further eight percent of male caregivers were employed irregularly in 'odd jobs' and 61 percent of male caregivers were unemployed. Thus, the inference derived is that 61% of participants in

the sample lived in nuclear families with no formal income. The percentage of caregivers receiving government grants was not investigated.

When examining levels of education among caregivers, the following was evident:

Table 11

Educational Levels of Caregivers of Participants

Educational Level	**Percentage**
Not educated at all or did not finish primary education	29%
Received secondary education but did not matriculate	35%
Matriculated	29%
Post matric certificate, but did not graduate	6%

64 percent of the sample did not complete their secondary education.

On examination of family size it was evident that 75 percent of participants resided in families that were raising three or more children. Given the low employment rates, low educational level, and large family size, it is evident that the most participants came from homes that were severely impoverished.

None of the participants attended a crèche or pre-school. Research has shown that child rearing practices, the quality of the home environment and the exposure to any form of nursery and pre-school stimulation can have significant influence on the child's later development (Griffiths, 1984; Hanson, 1982; Kerlinger, 1973; Van den Berg, 1985). This, in combination with the factors pertaining to SES should be noted as negatively contributing to the formation of optimal conditions for learning and development.

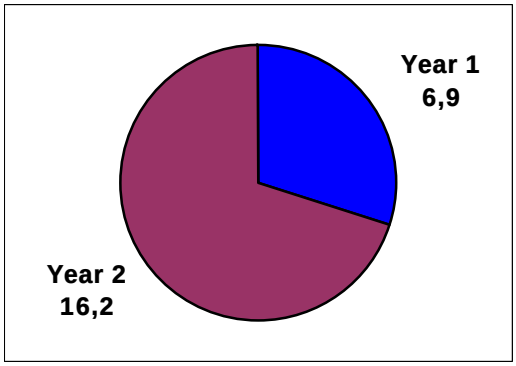
6.2.2 Age

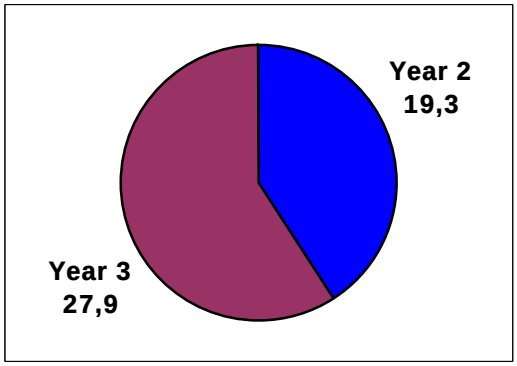
At first assessment the mean age for the whole sample was 12,0 months. Participants were all in year one or two, with the mean age for year one being 6,9 months, and for year two being 16,2 months. The minimum age at first assessment was 2,7 months, and the maximum age was 23,6 months.

At the second assessment, the mean age for the whole sample was 23,0 months. Participants were then all in year two and three, with the mean for year two being 18,3 months, and for year three being 27,9 months. The minimum age was 13,5 months and the maximum age was 35,4 months. There was thus a range of ages within the different assessment periods. Figures 4 and 5 visually depict the average age for assessment one and two.

Figures 4 and 5

Average Age at First and Second Assessment



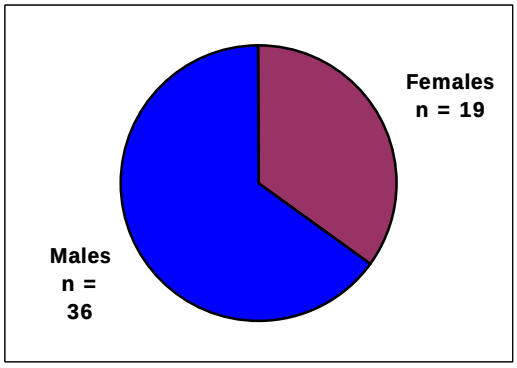


As is visually evident, the proportions of year levels at each assessment vary. Interim time between assessments was not constant, elucidating the varying proportions. Consequently, the sample may be further divided into two sub-samples of participants who were re-tested on average nine to 10 months (n=25) after the initial assessment, and participants who were retested on average 11-15 months (n=30) after the initial assessment. The average time between assessments for the sample as a whole was 11 months.

6.2.3 Gender

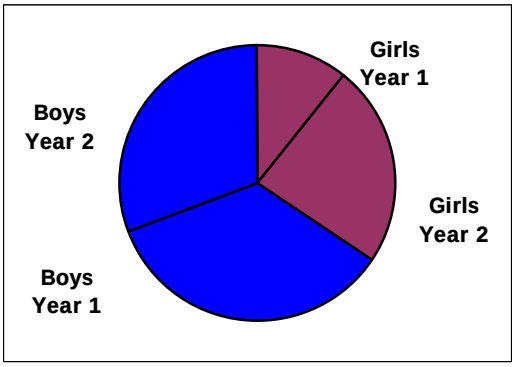
The sample of participants with HIV/AIDS, over both assessments, consisted of 35% girls (n=19) and 65% boys (n=36). Figure 6 depicts the gender distribution of the sample:

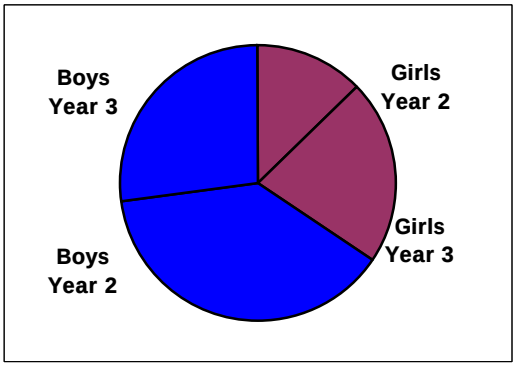
Figure 6
Gender of Participants



At the first assessment there were six girls and 19 boys in year one, and 13 girls and 17 boys in year two. At the second assessment there were seven girls and 21 boys in year two, and 12 girls and 15 boys in year three.

Figure 7 and 8
Gender as per Year Level for Assessment One and Two





Non-probability purposive and convenience sampling was used to locate participants, with their initial identification thus being convenience orientated. There is an equal susceptibility and incidence of HIV/AIDS within gender groupings. As the results of research exploring the influence of gender on performance on the GSMD are differential, the composition of the sample in terms of gender was not given priority, and may be seen as a limitation to the study.

6.2.4 Weight

Participant's weight was measured at first assessment. The mean weight of participants in year one was 6.6 kilograms. On average, infants not infected with HIV should weigh 9.55 kilograms in their first year (Salkind, 1985). The mean weight for infants in year two was 9.5 kilograms, with the average weight for infants not infected with HIV being 11,37 kilograms (Salkind, 1985). These comparisons show that at first assessment, participants in both year one and year two were on average underweight. Biographical information of participants was not collected at second assessment, and thus the weight of participants at this assessment could not be ascertained. This may be seen as a limitation to the study as biographical information may have provided important contextual information pertaining to the development of participants.

As examined in Chapter 3, children originating from lower SES regions are more prone to being malnourished, and thus to being physically smaller, with lower levels of energy and immunity. Thus the effect of SES on development needs to be considered when evaluating the performance of participants on the GSMD, as possibly having a negative impact.

6.2.5 Biographical questions

Appendix B portrays the questions presented to the caregivers that tap biographical details and birth and developmental history of participants.

These questions were identified by researchers as useful to the identification of extraneous variable that could contribute to the formation of developmental delay. Appendix C presents the frequencies and percentages computed according to caregivers' answers. Each question is followed by the number of caregivers that answered it (N). This number is then converted into a percentage (%) based on the answer given, namely, YES or NO.

For example, the second question is 'Did you give birth to your child naturally?'. 55 caregivers answered this question, of which 44 said yes, that is 80% of the sample, and 11 said no, that is 20% of the sample. Caregivers omitted some questions and consequently the number of respondents to questions may vary.

According to responses, the majority of caregivers perceived participants to experience no complications at birth; showing age-appropriate development with regards to walking, talking, and toilet training, and experiencing no additional medical conditions/infections such as meningitis, encephalitis, convulsions (fits), anaemia and allergies. Qualitatively it may be noted that participants presented with various complaints, such as vomiting, nausea, ear infection, and feeding problems. Medical problems that were noted by more than 15 percent of the sample are illustrated in Table 12.

Table 12

Medical Conditions Experienced by 15 or More Percent of Participants

Medical problem	No of Participants	Percentage
Coughing	16	29
Thrush	15	27
Asthma/breathing difficulties	11	20
Skin related problems	11	20
Fever	9	16

Most caregivers indicated that their charges were not currently taking any medication, and no participant was receiving ART. The high percentage of participants experiencing thrush should be especially highlighted, as this condition may be seen as an opportunistic infection frequently linked to individuals with HIV as well as individuals experiencing nutritional difficulties. It may be associated with weakened immunity and physical well-being. It is furthermore evident that most of the conditions in Table 12 may be noted within HIV related syndromes.

Thus it seems that medical information reported by caregivers contradicted objective information obtained about medical illnesses. Another example of contradicting information may be seen in the majority of caregivers reporting their charges to experience no developmental delays, however, results on the GSMD report the majority of participants, at first assessment, to fall within the below average range. Caregivers were questioned in their home language, however, whether they always understood questions is uncertain. Furthermore, limited insight into medical knowledge and lack of education may have impacted the information that was obtained. Thus, information gathered from caregivers should be considered with caution.

6.3 Performance of HIV positive/AIDS Infants and Children

Descriptive statistics were used to explore the performance of the sample of infants and children with HIV/AIDS. Statistics included measures of central tendency (e.g., mean) and measures of variability (e.g., standard deviation). Tables 13 and 14 depict the results of assessment one and two.

Table 13

Performance of HIV Positive/AIDS Infants and Children at First Assessment

GSMD	Mean	Performance Categorisation	Median	Min.	Max.	Range	Variance	Std. Dev.
GQ	89.45	Below Average	86.40	38.3	157.50	119.20	721.42	26.85
AQ	88.96	Below Average	92.10	31.68	208.20	176.52	1143.14	33.81
BQ	112.60	Above Average	116.00	11.81	183.00	171.19	1063.07	32.60
CQ	79.63	Borderline	74.50	30.5	166.70	136.20	793.75	28.17
DQ	89.80	Below Average	87.69	37.1	166.70	129.60	908.41	30.13
EQ	72.58	Borderline	68.72	17.92	158.20	140.28	932.73	30.54
FQ	88.53	Below Average	85.38	37.7	159.00	121.30	702.18	26.49

Table 14

Performance of HIV Positive/AIDS Infants and Children at Second Assessment

GSMD	Mean	Performance Categorisation	Median	Min.	Max.	Range	Variance	Std. Dev.
GQ	79.83	Borderline	74.70	40.80	132.70	91.90	510.07	22.58
AQ	78.52	Borderline	74.30	34.30	151.95	117.65	793.43	28.16
BQ	109.03	Average	103.50	48.70	219.00	170.30	1217.39	34.89
CQ	71.09	Borderline	67.60	36.20	112.10	75.90	407.72	20.19
DQ	69.27	Cog. impaired	67.04	46.12	114.80	68.68	300.70	17.34
EQ	72.71	Borderline	68.20	39.40	126.70	87.30	535.64	23.14
FQ	77.49	Borderline	73.57	37.80	132.15	94.35	433.76	20.82

The performance of participants, as presented in Tables 13 and 14, will now be explored in greater detail.

6.4 Performance of HIV positive/AIDS Infants and Children on the General Quotient

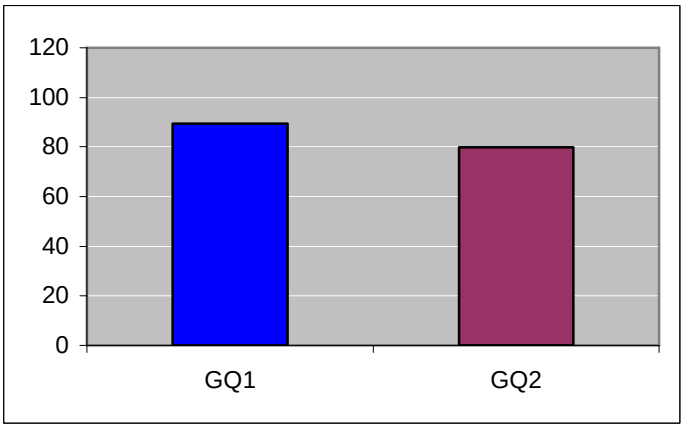
The General Quotient (G.Q.) gives an indication of average performance across the six subscales that constitute the GSMD.

The mean G.Q. for participants at first assessment was 89.45 (below average). The median score was 86,45 (below average), with a minimum score of 38.30, and a maximum score of 157.50. These extreme scores within the range indicate participants varied levels of skills in their general development, with some being highly skilled, and others being developmentally delayed. Results show a marked variance of 721.42 and a standard deviation of 28.85.

The mean G.Q. for participants at second assessment was 79.83 (borderline). The median score was 74.7 (borderline), with scores that cover a large range, with a minimum score of 40.80 and a maximum score of 132.70. The range of scores here also indicates the range of skills of participants. Results depict a marked variance of 510.07 and a standard deviation of 22.58. Figure 9 depicts the comparison of means at assessment one and two.

Figure 9

Comparison of the Means of the General Quotient at Assessment One and Two



It is evident that the mean G.Q. declined by one category over the two assessments, indicating either that participant's levels of skills declined, or that their skills did not develop further as their chronological age increased. The results of assessment one and two will now be explored in detail per individual subscale.

6.5 Performance of HIV positive/AIDS Infants and Children on the Locomotor Subscale (AQ)

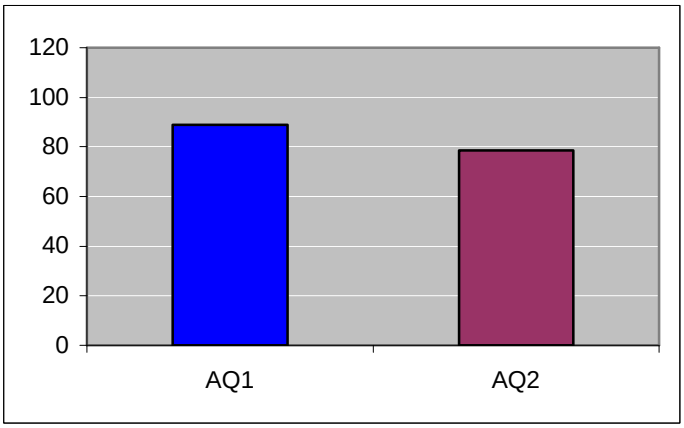
The Locomotor Subscale (A) provides the opportunity to observe certain physical weaknesses and disabilities, or more definite weaknesses of movement. Items include the walking up stairs, hopping, and kneeling on the floor.

The mean performance for participants at first assessment on this subscale was 88.96 (below average), and the median score at first assessment was 92.10 (average). The range was 176.52, with a minimum score of 31.68 and a maximum score of 208.20. These results indicate that participants in the sample showed a large variation in their locomotor development, with some being well developed, and others struggling in this area. Variance here was the largest at the first assessment at 1143.14, and a standard deviation of 33.80.

The mean performance for participants at second assessment was 78.52 (borderline) and the median 74.30 (borderline). The range was 117.65, with a minimum score of 34.30 and a maximum score of 151.95. Variance was slightly lower at 793.43 and with a standard deviation of 28.16. Thus scores indicate, as with first assessment, that participants show a wide range in their developmental abilities. Figure 10 depicts the comparison of means at assessment one and two.

Figure 10

Comparison of the Means of the Locomotor Subscale at Assessment One and Two



It is evident that the mean development of participants declined overtime, moving from below average to borderline performance. Bhamjee (1991) measured the performance of South African Indian four year to eight year old children across SES, and found a mean locomotor performance of 104.66. Allan (1998) measured the performance of South African five year old children, across SES and cultural groupings, and produced a mean of 121.26 on this subscale. The Locomotor Subscale is generally one of the subscales on which South African children score the highest. These studies all attained mean scores that are considerably higher than that of participants within the present study. Furthermore, the mean for the original standardisation sample from Britain in 1960 was 100.74, which is also substantially higher.

When attempting to understand these results the interaction of socio-economic and disease history on performance needs to be considered. As discussed in Chapter 3, children from lower SES backgrounds tend to be physically smaller, and influenced on the physical level by nutritional deficits. Also to be noted is that lower SES areas seldom have parks with trees or climbing apparatus, and thus there may be a lack of environmental stimulation to facilitate locomotor development. Furthermore, children who

are ill tend to be lethargic, lacking energy and drive. These influences have a combined impact on children's participation in activities around them, as well as their will to experiment within their environment. The effect is that children are physically and psychologically less inclined to participate in activities that would stimulate their locomotor development, despite SA having a good climate and opportunities for outdoor play being plentiful.

6.6 Performance of HIV positive/AIDS Infants and Children on the Personal-Social Subscale (BQ)

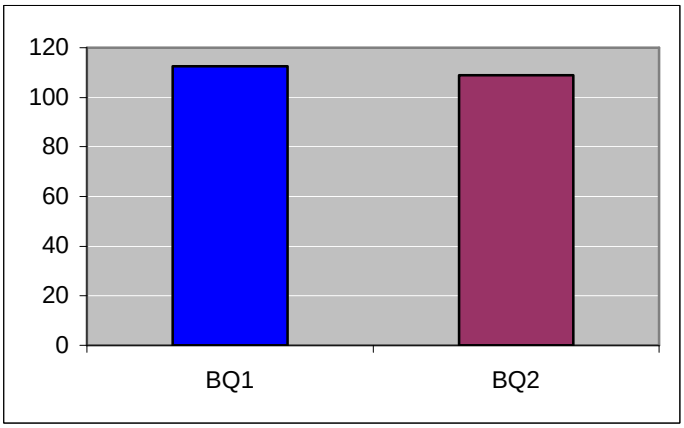
The Personal-Social Subscale (B) measures personal and social development. Items include showing parts of a dolls body, obeying a simple request such as fetching a cup, and giving private information such as their name.

The mean performance for participants at first assessment on this subscale was 112.60 (above average) and the median score at first assessment was 116.00 (above average). The range was 171.19, with a minimum score of 11.81 and a maximum score of 183.00. These results indicate that participants in the sample showed a large variation in their personal-social skills, with some being highly competent and others being developmentally delayed in this area. Variance within this subscale was 1063.07, and the standard deviation 32.60.

The mean performance for participants at second assessment was 109.03 (average) and the median 103.50 (average). The range was 170.30, with a minimum score of 48.70 and a maximum score of 219.00. Variance was slightly higher at 1217.39 and a standard deviation of 34.89. Thus scores indicate that participants showed a large variation at second assessment as well, although at this assessment the variation in their development was greater. Figure 11 depicts the comparison of means at assessment one and two.

Figure 11

Comparison of the Means of the Personal-Social Subscale at Assessment One and Two



As part of her study Bhamjee (1991) compared a sample of South African Indian children to the original British standardisation sample, and found South African children performed considerably better on this subscale than British children. Bhamjee related this to cultural and emotional differences effecting performance within the two groups. Possibly the elevated score on this subscale in the present study may be due to similar cultural and emotional variables elevating the scores of participants. The Xhosa culture is community based, with nuclear families tending to be large, and nested within the larger extended family system, which was evident when examining the biographical information of participants. Children are consequently exposed to a large amount of interaction from infancy. By nature of being ill, children also become aware of their bodies early on. Thus, items tapped by this subscale largely draw on socialisation skills that children are forced to develop throughout their young lives. Bhamjee (1991) states that child-rearing policies exert an influence upon the emergence of certain skills earlier than others. Furthermore, some of the items in this subscale are answered by caregivers, whose perception of the social abilities of their child may have positively influenced scores. This then provides a framework from which to understand the elevation of personal-social skills among

participants.

6.7 Performance of HIV positive/AIDS Infants and Children on the Hearing and Speech Subscale (CQ)

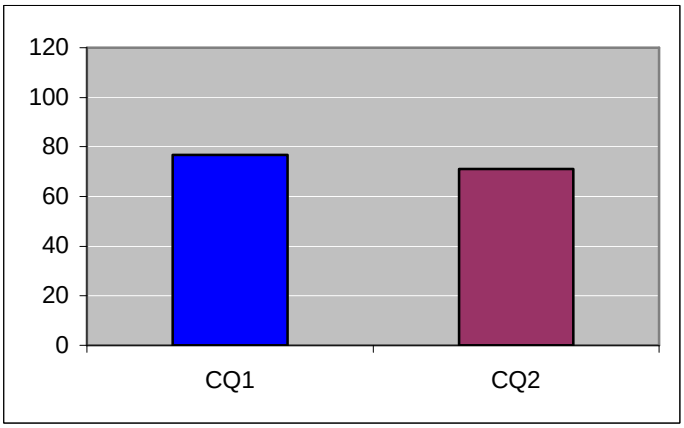
The Hearing and Speech Subscale (C) taps the most intellectual abilities through the assessment of growth and development of receptive and expressive language. The subscale requires comprehension of language, verbal expressive skills in terms of vocabulary and different parts of speech as well as the use of sentences and paragraphs. Items include the identification of objects, listening to stories and using word combinations. Performance on this subscale is particularly affected by deafness or some degree of hearing loss.

At first assessment, the mean performance for participants on this subscale was 79.63 (borderline) and the median score at first assessment was 74.50 (borderline). The range was 136.20, with a minimum score of 30.50 and a maximum score of 166.70. These results indicate that participants in the sample showed a large variation in the development of their hearing and speech, with some being highly competent and others being developmentally delayed in this area. Variance within this subscale was 793.75, and a standard deviation of 28.17.

The mean performance for participants at second assessment was 71.09 (borderline) and the median was 67.60 (cognitively impaired). The range was 75.90, with a minimum score of 36.20 and a maximum score of 112.10. Thus scores indicate that participants showed a large variation at second assessment as well, although the variance was slightly lower at second assessment, being 407.72, with a standard deviation of 20.19. Figure 12 depicts the comparison of means at assessment one and two.

Figure 12

Comparisons of the Means of the Hearing and Speech Subscale at Assessment One and Two



All individuals are genetically predisposed to a particular cognitive inheritance, which may be further stimulated environmentally. As participants age, inherited differences of ability gradually emerge (Hindley, 1965). Research shows that individuals from lower SES tend towards inheriting lower levels of cognition (Moore, 1968), which may then be applicable to the sample within this research study. Cognitive stimulation from an early age is very important to the development of further intellectual skills. As explored in Chapter 3, children from lower SES may not receive as much stimulation as is needed. Caregivers may themselves be ill and not have the personal or financial resources to provide for their children. As such, children may show a decreased exposure to repetition and imitation, which is vitally important within the context of language development. Piaget and Griffiths both differentiated between comprehension (understanding, passive speech) and expression (active speech) (Kotras, 2003), asserting that children need to develop a receptive vocabulary before the expressive vocabulary commences, for which repetition is vital. Not surprising then that research emphasises the higher tendency of children from a lower SES to develop language delay (Johnson et al., 1989).

It is further hypothesised that patterns of interaction influence the development of language, with caregivers from lower SES using short, simply understood sentences with their children, who consequently show a lower linguistic ability, with vocabulary, sentence structure and articulation being effected. McCarthy (1930) found that pre-school children's mean length of verbalised responses increase relative to their parents SES, which also substantiates this theory.

As has been indicated, the impact of HIV has been investigated in research, and hypothesises a decline in executive functioning and cognitive flexibility, with a marked slowness of mental processing and memory (Moore et al., 2004). Furthermore, a decline in immunity is linked to a decline in these processes. Thus, declining cognitive processes do not place a child in an optimal position to deal with SES conditions, and the combined influence of SES and HIV/AIDS factors may serve to delay the development of language.

6.8 Performance of HIV positive/AIDS Infants and Children on the Eye and Hand Co-ordination Subscale (DQ)

The Eye and Hand Co-ordination Subscale (D) relates to items of handwork and visual ability. Children are required to demonstrate manual dexterity, co-ordination between eyes and hands, careful work and persistence at a task. Items include the scribbling, building of towers, and playing at a rolling ball. Through these activities information may be gleaned about children's conception of space and form relations, and further information may be obtained about children's personalities from their drawings. The scales do not elucidate the interpretation and emotional significance of drawings, and are dependent on the clinician's own training in this area.

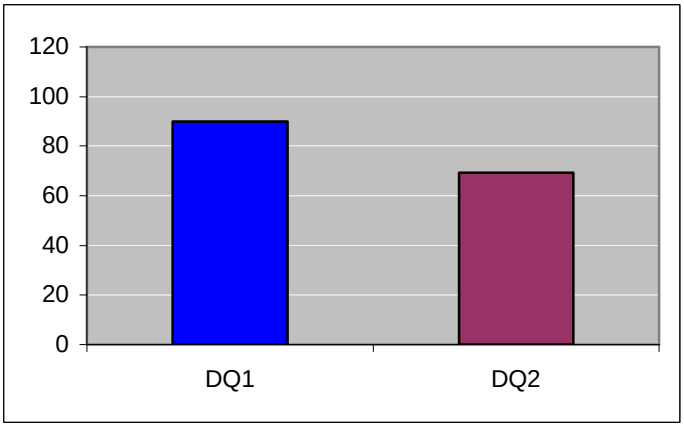
The mean performance for participants at first assessment on this subscale was 89.80 (below average) and the median score at first assessment was 87.69 (below average). The range was 129.60, with a

minimum score of 37.10 and a maximum score of 166.70. These results indicate that participants in the sample showed a large variation in their development of eye-hand co-ordination skills, with some participants being very skilled, and others being developmentally delayed. Variance within this subscale was 908.41, with a standard deviation of 30.13.

The mean performance for participants at second assessment was 69.27 (cognitively impaired) and the median 67.04 (cognitively impaired). The range was 68.68, with a minimum score of 46.12 and a maximum score of 114.80. Here too scores of participants illustrate a large range of skills. Variance was vastly lower at 300.70 and the standard deviation 17.34. Figure 13 depicts the comparison of means between assessment one and two.

Figure 13

Comparison of the Means of the Eye-Hand Co-ordination Subscale at Assessment One and Two



Scores on this subscale show a particular deterioration or limited progression over time, with the mean score moving from the below average range of performance to the cognitively impaired range as participant age. Furthermore, variance within this subscale at second assessment is the lowest compared with the other subscales, indicating that many participants performed lower here.

Hanson and Aldridge-Smith (1987) suggested that Hand and Eye-Coordination might be less advanced in the 1980s than other skills due to, amongst other factors, the quality of child rearing in general. It was postulated that physical freedom and self-expression might be more encouraged by child caretakers in the 1980s than skills requiring quietness and concentration that would be important for performance within this subscale. Due to severe impoverishment and lack of skills within the Kwazakhele community, it may be hypothesised that even some twenty years later children within this community experience a similar physical freedom and self-expression to children referred to by Hanson and Aldridge-Smith (1987) in the 1980s. Thus, instilling the skills of quietness and concentration may be neglected within this community. Furthermore, none of the participants within the sample attended a crèche or pre-school and thus did not experience formal encouragement of such skills. Furthermore, there is a lack of exposure to educational toys to promote such activities, as financial constraints do not allow for them.

Children who are HIV positive tend to be lethargic, show poor participation concentration and experimentation, and thus may not engage their environment very much to develop these skills on their own. Research implicates eye-hand co-ordination to be one of the first areas affected within HIV positive adults (Moore, 2002). Research further indicates that as HIV progresses, executive functioning is implicated, as well as perceptual abilities (Moore et al., 2004). The large decline in scores between assessments seems to indicate more than just the influence of SES, and thus may be greatly influenced by the presence of HIV. These results thus point toward a trend that is found in adults, and thus this area of functioning needs further confirmatory investigation.

6.9 Performance of HIV positive/AIDS Infants and Children on the Performance Subscale (EQ)

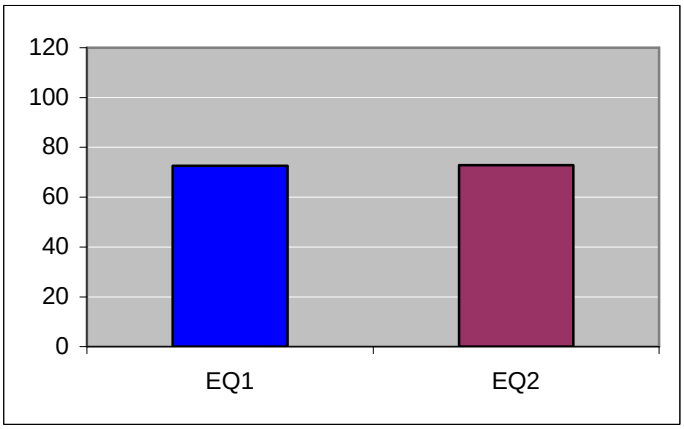
The Performance Subscale (E) involves performance-orientated tasks. In so doing it requires skills in manipulation, speed and precision of work, spatial perception and visual activity. Items include putting a lid back on a box, completing a form board, and removing cubes from a box. Items correlate with those on the Hand and Eye Co-ordination Subscale (D) in terms of the underlying skills of eye-hand co-ordination and manual dexterity being assumed, with the focus on the application of these skills to new situations.

The mean performance for participants at first assessment on this subscale was 72.58 (borderline) and the median score at first assessment was 68.72 (cognitively impaired). The range was 140.28, with a minimum score of 17.92 and a maximum score of 158.20. Participants thus showed a large variation in their development of performance skills, with some being very skilled, and others being developmentally delayed. Variance within this subscale for the first assessment was 932.73, with a standard deviation of 30.54.

The mean performance for participants at second assessment was 72.71 (borderline) and the median 68.20 (cognitively impaired). The range was 87.30, with a minimum score of 39.40 and a maximum score of 126.70, thus also showing a wide range in skills. Variance was 535.64 with a standard deviation of 23.14. Figure 14 depicts the comparison of means between assessment one and two.

Figure 14

Comparison of the Means of the Performance Subscale at Assessment One and Two



Scores on this subscale remained relatively stable within the borderline category across assessments. The original British 1960 standardisation sample produced a mean score of 101.44 on this subscale. Thus, more than 40 years later participants in this research study perform on average 29 points lower than the standardisation sample. However, it must be noted that the Performance Subscale (E) was one of the subscales that Allan (1998) found to be strongly affected by SES.

Children from a lower SES may be at a disadvantage in directing their eye-hand co-ordination skills to new situations. Their exposure to toys may be limited, and thus they may be more interested in the properties of the toys than the task requested of them, in a situation where pressure is heightened for them to perform with that toy. Furthermore, they may not be accustomed to completing tasks within a given time period, which may also detrimentally impact their performance.

The presence of HIV within has been linked to abnormalities of attention and short-term memory (Chase et al., 1995). Thus, the presence of HIV may effect concentration, and thus task tolerance, causing children to prematurely give up on an item. Being ill, children are less inclined to assert and act on their will, and thus their play is generally compromised, which

also influences their performance on items that are less structured. These factors should also be viewed with the fact that the underlying skills within this subscale, that of eye-hand co-ordination, are shown in research to be compromised in adults with HIV (Moore, 2002).

6.10 Performance of HIV positive/AIDS Infants and Children on the Practical Reasoning Subscale (FQ)

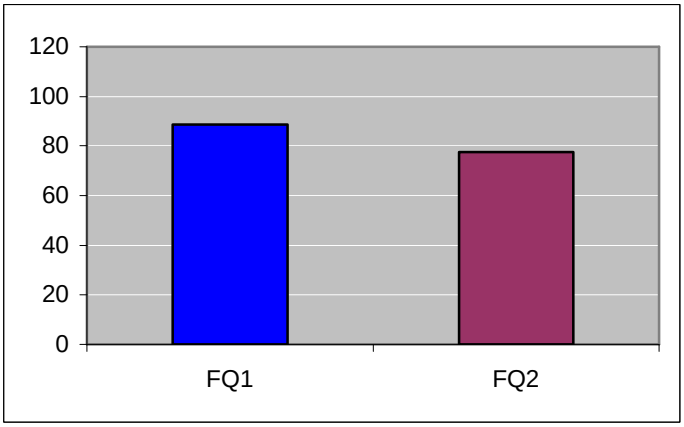
The Practical Reasoning Subscale (F) concentrates on the assessment of the most primitive indications of arithmetical comprehension, and the realisation of simple practical problems. Items include repetition of digits, counting, comparison of objects for size, length, weight etc. This scale requires children to reason about practical problems, and thus may be considered a predictor of school readiness in that scores give an indication of the child's ability to benefit from formal schooling.

The mean performance for participants at first assessment on this subscale was 88.53 (below average) and the median score at first assessment was 85.38 (below average). The range was 121.30, with a minimum score of 37.70 and a maximum score of 159.00. These results indicate that participants in the sample showed a large variation in their development of practical reasoning skills, with some participants being very skilled, and others being developmentally delayed in this area. Variance within this subscale was 702.18, and a standard deviation of 26.49.

The mean performance for participants at second assessment was 77.49 (borderline) and the median 73.57 (borderline). The range was 94.35, with a minimum score of 37.80 and a maximum score of 132.15. As with the first assessment, skills in this area were diverse. Variance was slightly lower at 433.76, with a standard deviation of 20.82. Figure 15 depicts the comparison of means between assessment one and two.

Figure 15

Comparison of the Means of the Practical Reasoning Subscale at Assessment One and Two



Scores on this subscale, over time, did not develop age appropriately, with the mean score moving from the below average range of performance to the borderline range. Furthermore, variance at second assessment is one of the lowest when compared with the other subscales, indicating that most participants performed lower here. Allan (1988) found that children from middle and lower SES performed lower on this subscale than children from higher SES. Practical Reasoning is the most intellectual of the six subscales, and thus it may be hypothesised that it be greatly affected by skills that are stimulated more formally within a crèche or pre-school, to which participants within the sample were not exposed.

As stated before, children are endowed with a particular cognitive inheritance, which in lower SES groups may be lower. As chronological age increases, the gap between mental age and chronological age also grows. Children may have slowed abilities, due to both cognitive inheritance and HIV, and thus expend a larger amount of time to learn and retain information. Furthermore, HIV is implicated in the decline of executive functioning, and this in combination with SES factors may impact on the child's ability to learn reasoning skills.

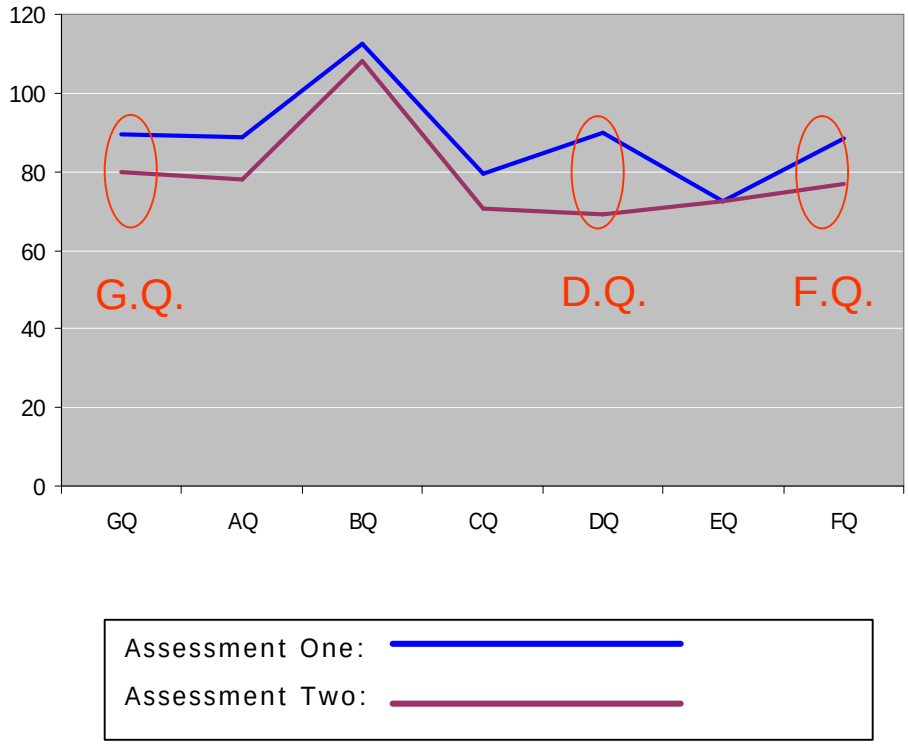
It is evident that the range of scores on the individual subscales, that is the difference between the minimum and maximum scores, vary considerably. Thus some participants were very skilled, even gifted, others were average, and some were developmentally delayed in their development. When examining the results statistically it was evident that the scores of participants were generally spread along a normal curve. The difference in performance ability may be influenced by inter-scorer reliability, as two registered Griffiths testers were involved in assessment the participants (n = 55). Thus, their subjectivity may have influenced the scoring process. It is further speculated that participants may have been at different stages of HIV progression, and this may have influenced their test performance. Thus, lack of more specific information on the progression of HIV within participants may be seen as a limitation when interpreting performance.

6.11 Comparison of the Performance of HIV positive/AIDS Infants and Children at Assessment One and Two

The developmental profiles of participants in assessment one and assessment two were compared in order to ascertain changes to the participants' development over time. Profiles were compared employing a Hotelings-T^2 test. Figure 16 depicts this comparison.

Figure 16

Comparison of the Performance of Infants and Children with HIV/AIDS at Assessment 1 and 2 Using the Hotelings-T² test



As is illustrated, the Hotelings-T² test highlighted three significant changes in the developmental profile of participants over time, namely at the level of G.Q., and at the Eye-Hand Co-ordination (D) and Practical Reasoning (F) subscales. There is a minimum of a 10-point difference in scores between assessments in these areas. Reasons underlying these changes have been explored with the individual subscale information.

As time between assessments varied, participants were divided into two groups namely nine to 10 months and 11 to 15 months between assessments, and the data was analysed separately for these two groups in order to ascertain the influence of time on results. Participants that had on average nine to 10 months between assessments (n = 25) showed a significant difference at the level of G.Q. and on only one subscale, that of Eye-Hand Co-ordination (D). Participants that were tested with on average

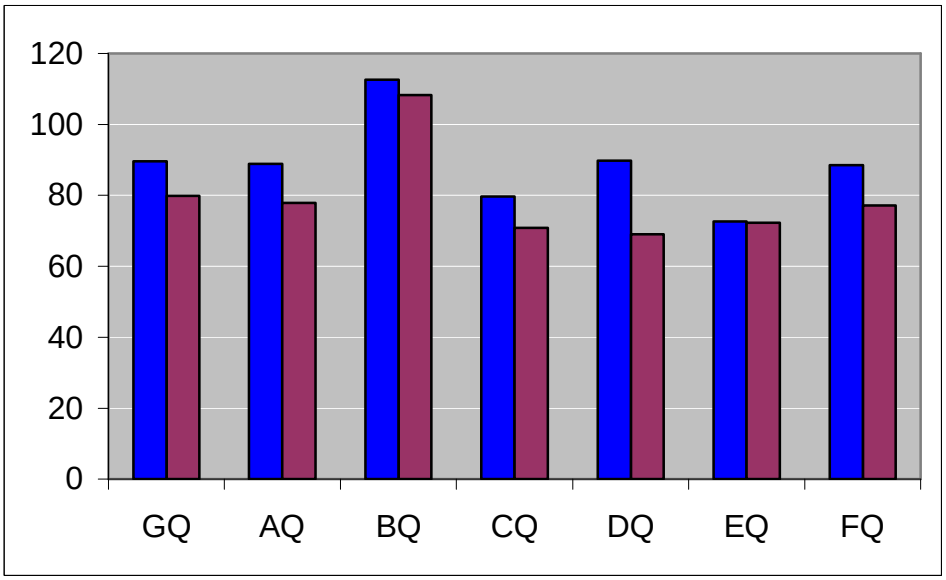
of 11 to 15 months (n = 30) between assessments showed a significant difference at the level of G.Q., and on two subscales, Eye-Hand Co-ordination (D) and Practical Reasoning (F), as with the larger sample. Thus, it may be concluded that time between assessments was an important variable and should be considered when interpreting the data.

Lister (1981) promoted their value and significance of using graphic representations to visually depict differences in a child's developmental profile. He found that substantial numbers of developmental profiles have been characterised by marked irregularly. Luiz (1988d) confirmed Lister's (1981) study and verified that usefulness of developmental profiles for identifying specific developmental delays in a clinical population of South African children. Through the analysis of profiles a vulnerable child or group may be recognised when evaluated against an established subtype profile. Areas of risk can thus be recognised, and may be targeted for specialised assistance.

In both Lister's (1981) and Luiz's (1988d) studies, differences between the highest and lowest developmental quotient were at least 16 points or more. These findings are relevant to the present research as performance of participants on the GSMD yielded results that showed a difference in the highest (BQ1 112.60) and the lowest (EQ1 72.58) developmental quotients for children with HIV/AIDS was approximately 40 points. This is in accordance with the findings of Lister (1981) and Luiz (1988d).

Figure 17

The Performance HIV positive/AIDS infants and children at First and Second Assessment



When examining Figure 17, representing the performance of participants at assessment one and two, it is evident that all areas of development are slightly depressed, and decline over time, except for the Personal-Social Subscale (B), which declines but remains within the average range at both assessments. Examination of possible reasons for an elevation of skills on this subscale occurred when exploring the results of the individual subscale. It may be hypothesised that this profile may be representative of Black HIV positive/AIDS infants and children from lower socio-economic backgrounds, and may be confirmed through further exploration in this area.

6.12 Profiles of the Performance of HIV positive/AIDS Infants and Children as Explored per Year Group

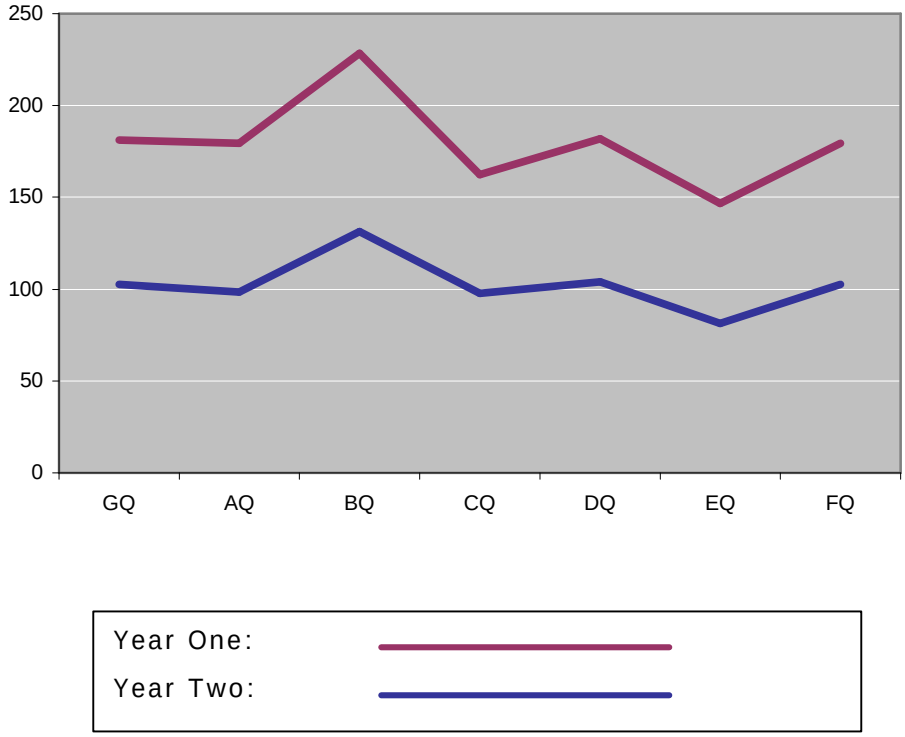
In order to further explore the developmental profile of Black South African HIV positive/AIDS infants and children, participants were divided into

two groups, both at first assessment and at the second, according to their year level.

At the first assessment, the mean age for year one was 6.9 months, and the mean age for year two was 16.2 months. Figure 18 graphically depicts the developmental profiles of participants at first assessment, according to these year levels.

Figure 18

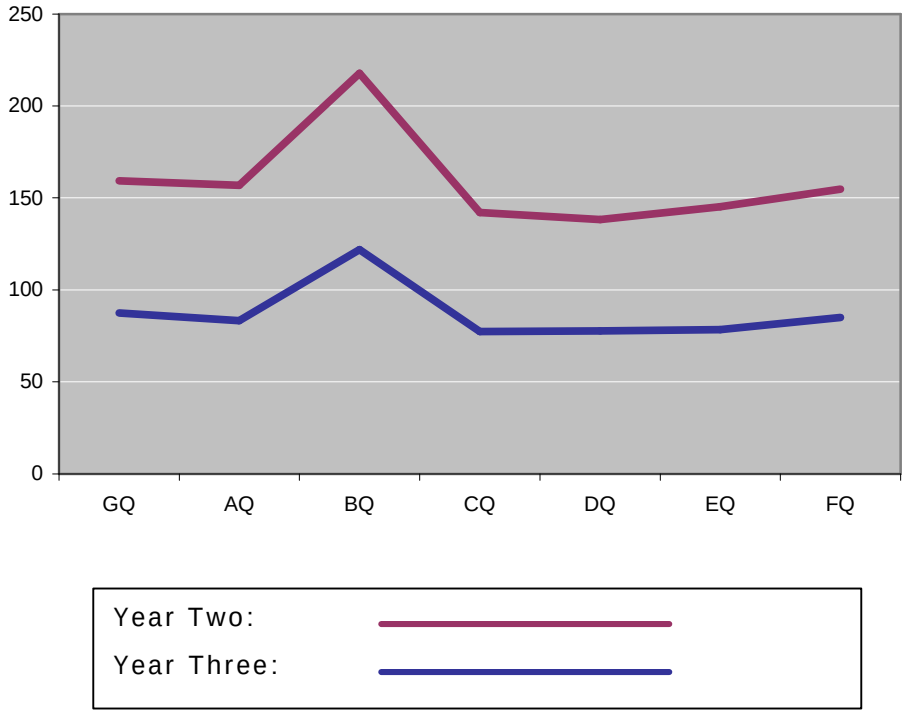
Performance of HIV positive/AIDS Infants and Children at First Assessment when divided into Years One and Two



At second assessment the mean age for year two was 18.3 months, and the mean for year three was 27.9 months. Figure 19 graphically depicts the developmental profiles of participants at second assessment according to these year levels.

Figure 19

Performance of Infants and Children with HIV/AIDS at Second Assessment when divided into Years Two and Three



It is evident from the pattern of the profiles that areas of strength and weakness remain similar across assessments. However, extremes within the range of performance are less severe at assessment two, showing not only a decrease in variation, but a decline in all scores measured. The profiles seem to flatten out more as the participants age. A third assessment of participants would thus be necessary to explore this hypothesis further in order to draw definite conclusions.

When examining the means per year level across assessments for the individual subscales, the following scores are evident.

Table 15

Means Across Year Levels for Assessments One and Two

QUOTIENT	YEAR 1	YEAR 2	YEAR 2	YEAR 3
GQ	102.53	78.56	87.50	71.87
AQ	98.49	81.02	83.35	73.51
BQ	131.15	97.14	121.81	95.77
CQ	97.69	64.58	77.43	64.50
DQ	103.97	78.00	77.84	60.38
EQ	81.43	65.21	78.51	66.70
FQ	102.57	76.82	84.93	69.78

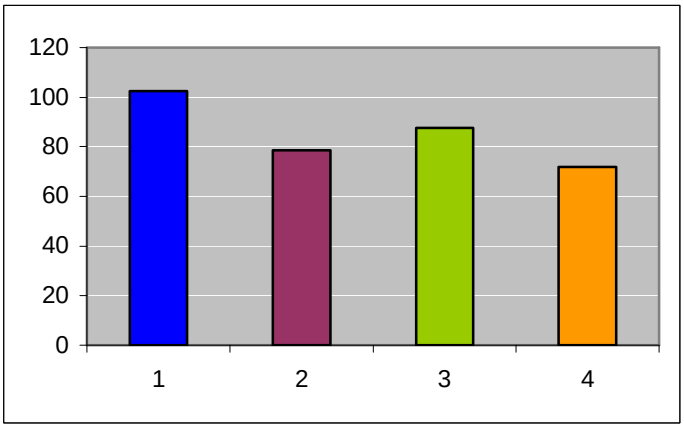
The means of participants, as analysed per year level, will now be explored per subscale, in order to track the variation in skills as participants age.

6.13 Means of HIV positive/AIDS Infants and Children on the General Quotient as Examined Per Year level

The mean performance for participants at first assessment in year one on the G.Q. was 102.53 (average) and in year two was 78.56 (borderline). At second assessment, participants now in year two produced a mean of 87.50 (below average), and participants in year three, 71.87 (borderline). Figure 20 depicts the mean scores of participants on the G.Q. per year level.

Figure 20

Comparison of the Means of the General Quotient Across Year Levels



1	assessment 1, year 1
2	assessment 1, year 2
3	assessment 2, year 2
4	assessment 2, year 3

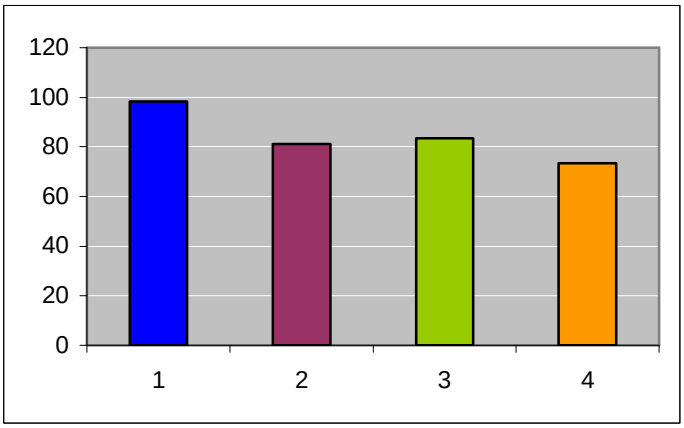
There was some variation in the two year two scores, although within assessments, there was a largely a deterioration of skills as participants aged.

6.14 Means of HIV positive/AIDS Infants and Children on the Locomotor Subscale As Examined Per Year level

The mean performance for participants at first assessment in year one on the Locomotor Subscale was 98.49 (average) and in year two was 81.02 (below average). At second assessment, participants now in year two produced a mean of 83.35 (below average), and participants in year three, 73.51 (borderline). Figure 21 depicts the mean scores of participants on the Locomotor Subscale per year level.

Figure 21

Comparison of the Means of the Locomotor Subscale Across Year Levels



1	assessment 1, year 1
2	assessment 1, year 2
3	assessment 2, year 2
4	assessment 2, year 3

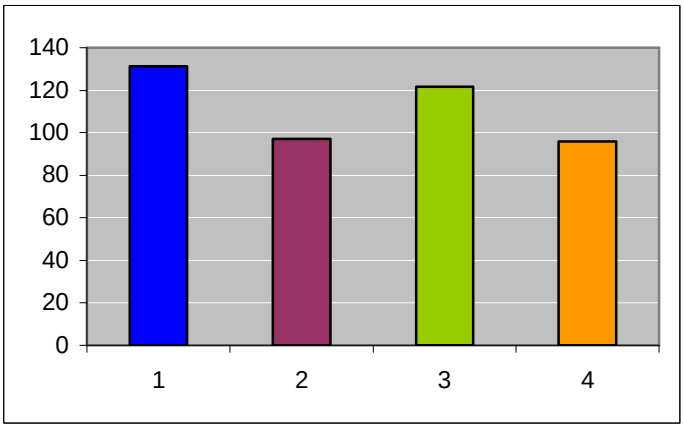
It is evident from these scores that locomotor skills steadily declined as participants aged.

6.15 Means of HIV positive/AIDS Infants and Children on the Personal-Social Subscale As Examined Per Year Level

The mean performance for participants at first assessment in year one on the Personal-Social Subscale was 131.15 (very superior) and in year two was 97.14 (average). At second assessment, participants now in year two produced a mean of 121.81 (superior), and participants in year three, 95.77 (average). Figure 22 depicts the mean scores of participants on the Personal-Social Subscale per year level.

Figure 22

Comparison of the Means of the Personal-Social Subscale Across Year Levels



1	assessment 1, year 1
2	assessment 1, year 2
3	assessment 2, year 2
4	assessment 2, year 3

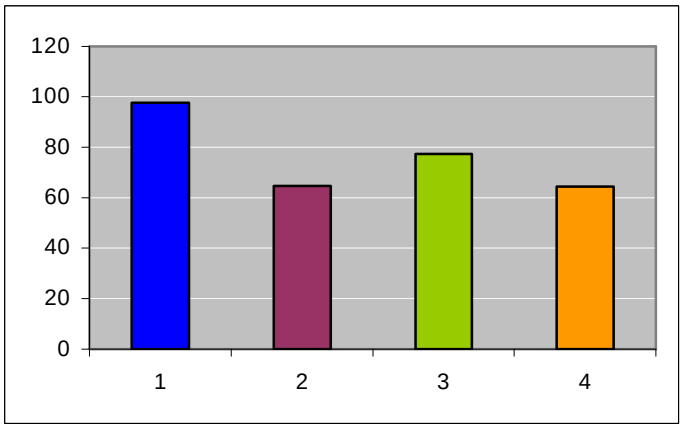
There is some variation in the two year two scores, although it is evident from these scores that within assessments, there was a largely a deterioration of Personal-Social skills as participants aged.

6.16 Means of HIV positive/AIDS Infants and Children on the Hearing and Speech Subscale As Examined Per Year Level

The mean performance for participants at first assessment on the Hearing and Speech Subscale in year one was 97.69 (average) and in year two was 64.58 (cognitively impaired). At second assessment, participants now in year two produced a mean of 77.43 (borderline), and participants in year 3, 64.50 (cognitively impaired). Figure 23 depicts the mean scores of participants on the Hearing and Speech Subscale per year level.

Figure 23

Comparison of the Means of the Hearing and Speech Subscale Across Year Levels



1	assessment 1, year 1
2	assessment 1, year 2
3	assessment 2, year 2
4	assessment 2, year 3

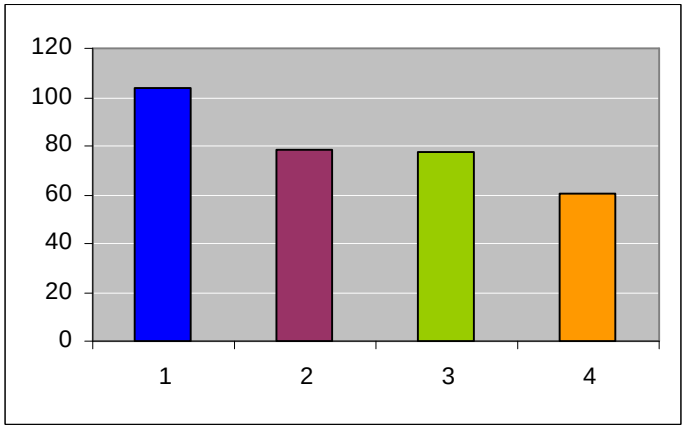
There was a fair variation in the two year two scores, although there was again a large difference in the scores between age levels within assessments, with a general decline in scores.

6.17 Means of HIV positive/AIDS Infants and Children on the Eye and Hand Coordination Subscale As Examined Per Year Level

The mean performance for children at first assessment in year one on the Eye and Hand Coordination Subscale was 103.97 (average) and in year two was 78.00 (borderline). At second assessment, participants now in year two produced a mean of 77.84 (borderline), and participants in year three, 66.70 (cognitively impaired). Figure 24 depicts the mean scores of participants on the Eye-Hand Co-ordination Subscale per year level.

Figure 24

Comparison of the Means of the Eye-Hand Co-ordination Subscale Across Year Levels



1	assessment 1, year 1
2	assessment 1, year 2
3	assessment 2, year 2
4	assessment 2, year 3

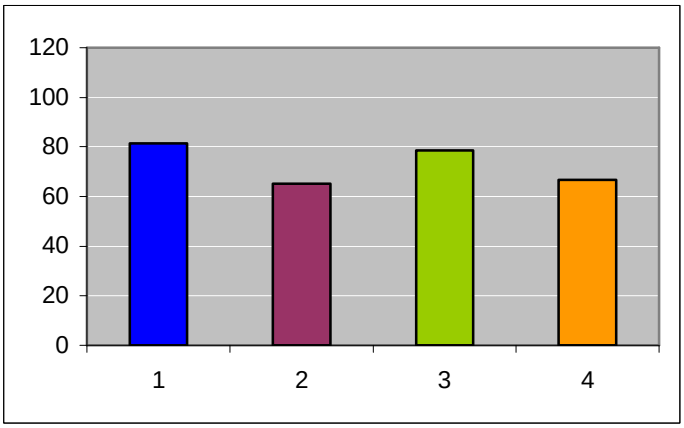
Performance on this subscale thus showed a clear deterioration of Eye-Hand Co-ordination skills as participants aged.

6.18 Means of HIV positive/AIDS Infants and Children on the Performance Subscale As Examined Per Year Level

The mean performance for participants at first assessment in year one on the Eye and Hand Coordination Subscale was 81.43 (below average) and in year two was 65.21 (cognitively impaired). At second assessment, participants now in year two produced a mean of 78.51 (borderline), and participants in year three, 66.70 (cognitively impaired). Figure 25 depicts the mean scores of participants on the Performance Subscale per year level.

Figure 25

Comparison of the Means of the Performance Subscale Across Year Levels



1	assessment 1, year 1
2	assessment 1, year 2
3	assessment 2, year 2
4	assessment 2, year 3

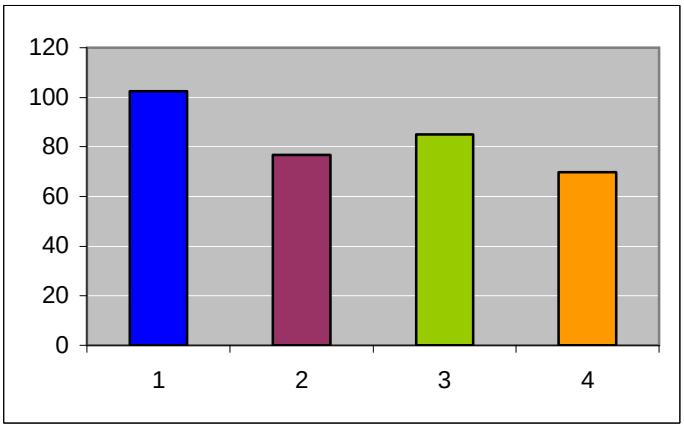
There was a fair variation in the two year two scores, with a large difference between scores within assessments, at the various age levels, showing a general decline in skills as participants aged.

6.19 Means of HIV positive/AIDS Infants and Children on the Practical Reasoning Subscale As Examined Per Year Level

The mean performance for participants at first assessment in year one on the Eye and Hand Coordination Subscale was 102.57 (average) and in year two was 76.82 (borderline). At second assessment, participants now in year two produced a mean of 84.93 (below average), and participants in year three, 69.78 (cognitively impaired). Figure 26 depicts the mean scores of participants on the Practical Reasoning Subscale per year level.

Figure 26

Comparison of the Means of the Practical Reasoning Subscale Across Year Levels



1	assessment 1, year 1
2	assessment 1, year 2
3	assessment 2, year 2
4	assessment 2, year 3

There was again a fair variation in the two year two scores, with a large difference between scores at the various age levels, and a general decline in skills as participants aged.

When examining differences in the various subscale means per year level, it is evident that scores generally declined as participants aged. Although older children tend to produce more moderate scores on the GSMD than younger children, this generally occurs from the age of five. Usually, external variables should be considered when trying to understand inflated or deflated scores.

The extent to which subject variables such as gender, language and SES influence performance has been widely investigated. Dominant findings indicate that SES plays a significant role in test performance (Eggen & Kauchak, 2004), and thus should be considered when interpreting results. It is interesting to note that Golden and Birns (1976) indicate that social class differences only emerge between the ages of 18 and 24 months, and assert

their to be no relationship between social class and intelligence. Furthermore, Huntley (1996) found no relationship between SES and scores on the GSMD. However, extensive research has been conducted in SA on the GSMD documenting the negative impact of subject variables on individual's test performance (Allan, 1992; Mothuloe, 1990; Bhamjee, 1991; Stewart, 1997), although most of this research focuses on children of four years and older. As the effect of SES on children below the age of 24 months needs more exploration, within the present context the influence of SES on performance needs to be considered. Furthermore, research examining the effect of HIV/AIDS on the deterioration of functioning was expanded on in Chapter 2. Thus, as also examined under the individual subscales presenting the scores of assessments one and two, the influence of HIV/AIDS and SES have been isolated as impacting performance significantly. As such, they may be postulated as fundamental to the decline in scores over time.

Many individuals from very impoverished SES strata's tend to have much of their energy focused on meeting basic needs, and these needs dominate in their struggle to survive. Furthermore, caregivers may be ill themselves, with limited access to antiretroviral medication for themselves and their child(ren). This forms important contextual information in understanding the background of participants, as caregivers may not be in a favourable position to create the most optimal environment to facilitate their child's learning.

When examining the impact of variables HIV/AIDS and SES on performance, little is known of the impact of HIV/AIDS when compared with SES, which has been researched for decades. Thus the influence of HIV is tentatively postulated and at times difficult to separate from the impact of HIV/AIDS.

6.20 Chapter Overview

The primary aim of the study was to explore and describe the developmental profiles of Black HIV positive/AIDS infants and children, from lower SES, aged three to 35 months over two assessments, in the Nelson Mandela Metropole, utilising the Revised Extended Griffiths Scales of Mental Development (GSMD). The six areas of general development assessed included: Locomotor, Personal-Social, Hearing and Speech, Eye –and Hand Co-ordination, Performance and Practical Reasoning. This has occurred by examining the performance of participants over two assessments, and through descriptive statistics describing the differences in their performance both generally, and at the individual subscales, both at when examining scores at the two assessments, as well at the various year levels.

Chapter 7 will now examine the main conclusions of the study, as well as limitations that need to be considered when interpreting these results, and recommendations for the future.

Chapter 7
CRITICAL EVALUATION AND CONCLUSION

7.1 Introduction

The objective of the present research was to address the dearth of information regarding the effect of HIV/AIDS on the general development of infants and young children. Thus the aim of the study was to explore and describe the developmental profile of Black HIV positive/AIDS infants and children, aged three to 35 months, over two assessments, in the Nelson Mandela Metropole utilising the Revised Extended Griffiths Scales of Mental Development (GSMD). The developmental profile of participants was compared across assessments and across year levels.

Chapter 7 now examines the main conclusions of the study, as well as limitations that need to be remembered when considering the results, and recommendations for future areas of research.

7.2 Conclusions of the Study

This study explored the developmental profile of HIV positive/AIDS infants and children, which is a relatively new research area. Thus the present research has served to generate more information to address a lack of knowledge in this area. The main findings of the study will now be discussed below.

The biographical information attained produced few trends that could be pinpointed to significantly influencing test performance. It was evident that many participants came from large extended families that were extremely impoverished. No participants attended a crèche or pre-school, and the vast majority were not receiving any medication. No participant was receiving antiretroviral medication.

Participants were identified through their caregivers' attendance of an HIV support group at the Dora Nginza Hospital. Caregivers were referred to

the support group from Kwazakhele Day clinic, Dora Nginza Hospital and Livingstone Hospital, which they attended for medical concerns. Many participants presented with HIV/AIDS related illnesses. However, when questioned, their caregivers did not necessarily attribute these illnesses as HIV related. Examples of such illnesses include coughing, thrush, asthma/breathing difficulties, skin related problems and fever.

When examining the performance of participants over the two assessments on the GSMD, various findings were evident. The scores on the General Quotient (G.Q.) and on four of the six subscales declined over time by at least one category. Scores on the Hearing and Speech Subscale (C) and Performance Subscale (E) stayed within the same category, which was borderline for both subscales, although they declined slightly within this category.

The comparison of the developmental profiles of participants between assessments showed statistically significant changes in scores on the G.Q., Eye-Hand Co-ordination Subscale (D) and Practical Reasoning Subscale (F). Thus, over time, no development occurred. As time itself varied between assessments, participants were divided into two groups, those with an average time between assessments of nine to 10 months, and those with an average time of 11-15 months. Comparisons within these two groups also showed significant differences on G.Q. and Eye-Hand Co-ordination Subscale (D) for the group of nine to 10 months, and G.Q., Eye-Hand Co-ordination Subscale (D) and Practical Reasoning (F) for the later group, as seen with the main sample group. Thus, the influence of time in the deterioration of skills may be highlighted.

When comparing the highest and lowest scores of the individual subscales, there is a 40-point difference at first and second assessment. This shows a significant variation in the profile produced, and according to the research of Lister (1981) and Luiz (1988d) signifies the profile of a child at risk.

When examining the developmental profile of participants per year level, it is evident that areas of strength and weakness remain similar. However,

extremes within the range of performance are less severe at assessment two than assessment one, with a gradual decline or flattening of the profile of participants as they age. This flattening occurred in all areas except for the Personal-Social Subscale (B). A third assessment of participants would be necessary to further establish a true pattern.

Finally, when examining the differences between the means of the G.Q. and subscales per year level, it is evident that scores of participants generally declined over time.

7.3 Limitations of the Study

7.3.1 Limitations regarding research design

This study examined the performance of Black HIV positive/AIDS infants and children, from lower SES, aged three to 35 months over two assessments, in the Nelson Mandela Metropole. The design chosen for the research was exploratory descriptive, and thus by its nature no inferences or cause-and-effect conclusions could be made. A strong limitation may be seen in the variability of time between assessments. A standard time between assessments was not built into the research design, and was complicated by various logistical factors, and thus the influence of time on the performance of participants is unknown.

The variables of culture, language and SES were built into the research design, in order to control for variables that may impact performance, and this inclusion served to strengthen the research design. Participants were included in the research study only if they resided in Kwazakhele, an area classified as a lower SES region within the Nelson Mandela Metropole. However, this inclusion criterion served to decrease the generalisability of results to other geographical areas.

Participants between the ages of three and 35 months were included in the study, which further limits the age group to which results may be associated. Finally, gender was not a variable that was controlled for within

the study. Due to the differential results found with regards to the impact of gender on performance on the GSMD in previous studies, its effect is unknown. The regulation of gender was further complicated by the high attrition rate within the sample. This may be seen as a further limitation to the study.

Finally, SES is a compelling variable, and its influence in the performance of participants cannot be accounted for. It is hoped that as participants are compared with their own performance over time, that its influence was reduced as results were consistently compared in the presence of this variable. However, throughout the examination of results the interchange between the influence of HIV and SES needs to be taken into consideration.

7.3.2 Limitations regarding participants

The sample size was fairly small, being N = 55. At the initial assessment the sample was made up of N = 75 participants. However, by nature of the disease that participants suffer from, mortality decreased the number of participants over time. This may be seen as a limitation, as a smaller sample size decreases the generalisability of results.

7.3.3 Limitations regarding assessment measures

The GSMD was a useful measure within the context of this research, assessing participants on six areas of their development, namely, Locomotor, Personal-Social, Hearing and Speech, Eye-Hand Co-ordination, Performance and Practical Reasoning. The biographical questionnaire was used to ascertain variables that might influence performance on the GSMD in these areas. However, the biographical information that was gathered may be questioned regarding its accuracy. Caregivers gave answers based on their perception of their child's progress. This perception however produced some inconsistencies, for example, caregivers mostly perceived their children as

developmentally on par when the test results showed the mean performances of participants to be below average. Thus, a lack of objectivity and insight from caregivers may have affected results.

No biographical information was collected at second assessment. Thus, changes in biographical information were not noted, and variables such as weight and secondary illnesses could not be tracked. Their effect on the participants' development is thus unknown.

Apart from the participants' initial HIV diagnosis, information regarding disease progression was not known. Thus the influence of progressive HIV disease on performance could not be tracked. The disclosure of further information on HIV progression from medical records was complicated by confidentiality and logistical controls, which were insurmountable. This may be seen as an additional limitation.

Finally, research has highlighted areas of concern with the GSMD in identifying some items as potentially culturally bias, and as such these items have been revised in the GMDS-ER. Thus, the use of this measure may be seen as a limitation. However, the GMDS-ER was not yet launched when participants were assessed. Furthermore, the GSMD has been translated into Xhosa, and has been used as such within previous research studies, which has not yet occurred with the GMDS-ER, and the advantage of testing participants in their home language could not be ignored. Given that the present study measures development longitudinally, problems within the GSMD may have less of a negative impact to participants as they are compared to themselves in order to ascertain changes in their development. Given that extraneous variables are controlled for as far as possible, most variables that do exist should theoretically affect all participants, and thus exploration of developmental trends is validated.

7.3.4 Limitations regarding assessment process

Assessments were conducted by two Xhosa-speaking psychologists who were registered Griffiths users. An advantage was thus that participants

were assessed in their home language. Furthermore, the psychologists were familiar with the Xhosa-culture, which promoted their ability to relate comfortably to participants and their caregivers. However, the researcher did not perform the assessments, and thus valuable qualitative information gathered through observation may have been lost.

Despite the limitations of the present study, this was an initial exploration of a relatively new research area. It has highlighted important variables that need to be considered when conducting further research in this area, and despite limitations, provides important information regarding the development of HIV positive/AIDS infants and children which is valuable, and creates interesting questions for further research.

7.3 Recommendations for Future Research

The assessment of HIV positive/AIDS infants and children is important in generating knowledge about their physical and motor, cognitive, and socio-emotional development. This information is valuable to caregivers, guardians, medical practitioners, teachers, AIDS havens, and all others who are the minders of these children, and thus the custodians of their health and welfare. The developmental stimulation of HIV positive/AIDS infants and children is vitally important. Findings of the present research indicate that programmes should focus on the development of eye-hand co-ordination and practical reasoning skills, as skills in these areas seem to decline or do not progress over time, thus their stimulation would be particularly valuable to such children.

Assessing participants over a longer period of time may provide valuable information on the progression of the developmental profile. This should be considered when planning further research in this area. In addition, information regarding the stage of HIV progression would be valuable in order to correlate performance to disease progression. With the increased availability of ART, a further interesting area of research would be examining the influence of ART on disease progression over time.

The exploration of the developmental profile of HIV positive/AIDS infants and children contributes to the pool of HIV/AIDS information, and adds to the state of child health in this country, by providing information to increase the quality of care and quality of life. As such, the present research study has generated valuable information, and has highlighted issues for future research in the area.

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APPENDIX A

Breakdown Of Clinical Manifestations Associated With The Stages Of HIV

Category	Characteristics
N	No signs or symptoms considered to be the result of HIV infection or only 1 condition listed in A
A Mild	2 or more conditions listed below but none from B or C • Lymphadenopathy (>/ 0.5cm at more than 2 sites; bilateral, 1 site). • Hepatomegaly • Splenomegaly • Parotitis • Dermatitis • Recurrent or persistent upper respiratory tract infections, sinusitis, or otitis media
B Moderate	Symptomatic conditions other than A or C and attributed to HIV infection; including but not limited to: • Anaemia (<8g/L); neutropaenia (<1 000/mm3); thrombocytopaenia (<100 000/mm3)-persisting >/ 30 days • Bacterial meningitis, pneumonia or sepsis (single episode) • Candidiasis, persisting >/ 2 months in children > 6 months of age • Cardiomyopathy • Cytomegalovirus (CMV) infection, onset <1month of age • Herpes simplex virus (HSV) stomatitis>2 episodes within a year • HSV bronchitis, pneumonitis or oesophagitis with onset <1 year of age • Herpes zoster (shingles)>/ 2 episodes or > 1 dermatome • Leiomyosarcoma • Lymphoid interstitial pneumonitis (LIP) or pulmonary lymphoid hyperplasia complex • Nephropathy • Nocardiosis • Persistent fever (>1 month) • Toxoplasmosis, onset <1month of age • Varicella, disseminated

Category	Characteristics
C Severe	Any condition listed below: • Serious bacterial infections, multiple or recurrent (at least 2 culture-confirmed episodes within a 3 year period) of: septicaemia, pneumonia, meningitis, bone or joint infection, or abscess of an internal organ or body cavity • Candidiasis (oesophageal or pulmonary). • Coccidioidomycosis, histoplasmosis or cryptococcosis (disseminated). • CMV disease with onset of age >1 month (at site other than lymph nodes, spleen, liver) • Encephalopathy • HSV causing mucocutaneous ulcer persisting > 1 month, or bronchitis, oesophagitis, pneumonitis, oesophagitis in a child older> 1 month • Kaposi sarcoma • Lymphoma, primary in brain, Burkitt's immunoblastic, large cell, B cell or unknown. • *Mycobacterium tuberculosis* (disseminated or extrapulmonary) • *Mycobacterium avium* complex or *Mycobacterium kansasii* (disseminated). • PCP • Progressive multifocal leukoencephalopathy • Salmonella septicaemia (recurrent) • Cerebral toxoplasmosis with onset > 1 month of age • Wasting syndrome in absence of illness other than HIV that could explain the following: persistent weight loss > 10% of baseline, or downward crossing of at least 2 of the following percentiles on a weight for age chart (95th, 50th, 25th, 5th) in a child>/ 1 year of age; or < 5th centile weight for height on 2 consecutive measurements >/ 30 days apart plus 1) chronic diarrhoea (>/ 2 loose stools per day >/ 30 days); or documented fever >/ 30 days intermittent or constant.

APPENDIX B

Biographical Questionnaire Completed By Participant's Parent(S)

Today's date: …….

Child's name: .....

Home address: …….

Phone number (if applicable): (h) ..... (w) .....

Child's date of birth: (Day) ……. (Month) ……(Year) ……

Child's age:.....

Child's gender: male…… female ……

Home language:.....

Does your child attend a creche/pre-school? .....

How many children are in your family? .....

Where is your child positioned in the family ?

(i.e., eldest, youngest, etc) .....

Religion: .....

Mother's age: .....

occupation: .....

educational qualification: (please tick the appropriate space)

None .....

Primary School .....

Junior certificate (eg. Std 8) .....

Apprenticeship .....

Matric .....

Further training (not at university) .....

University degree/diploma .....

Father's age:.....

occupation:.....

educational qualification: (please tick the appropriate space)

None .....

Primary School .....

Junior certificate (eg. Std 8) .....

Apprenticeship .....

Matric .....

University degree/diploma .....

Birth History:

1. Describe anything unusual about your pregnancy or delivery:

……

……

(Please tick Yes or No)

	Y	N
2. Did you give birth to your child naturally?		
3. Was your child anoxic (i.e., did s/he lack oxygen) at birth?		
4. Was your child born either prematurely or after more than 40 weeks of		
5. Is your child one of a twin?		
6.Was walking, talking and toilet training normal?		
7. Was feeding development normal?		
8. Has your child ever had Meningitis?		
9. Has your child ever had Encephalitis?		
10. Has your child ever had Convulsions (fits)?		
11. Has your child ever had Concussion?		
12. Has your child ever had Anemia?		
13. Has your child ever had a very high fever/temperature?		
14. Has your child ever had a head injury where s/he lost		
15. Has your child ever had an allergy?		
16. Does your child complain of headaches?		
17. Is your child clumsy?		
18. Does your child have dizzy spells sometimes?		
19. Does your child often have nightmares?		
20. Does your child sometimes fall deeply asleep even though it is not his/her bedtime?		
21. Does your child have temper tantrums regularly?		
22. Does your child wet the bed regularly?		
23. Does your child sometimes stare blankly into space?		
24. Does anyone in your immediate family circle suffer from		
25. Do you notice a muscle or group of muscles twitching in		
26. Is your child on any kind of medication? If YES, what		
27. Does your child get on well with other children?		
28.1s your child restless and does s/he struggle to		
29. Does your child start crying for no apparent reason?		

30. List all childhood diseases:

……

……..

Thank you for your co-operation.

All information supplied will be treated as strictly confidential.

Consent By Parents

I, the undersigned hereby give my permission for my child to be included in the research project being conducted by the University of Port Elizabeth (UPE) exploring a developmental profile of HIV infected children, using the Revised Extended Griffiths Scales of Mental Development. I understand that the process will include giving consent for my child to participate by signing this form and by providing biographical information. I understand that all information will be treated as strictly confidential.

Signature:..... Date: .....

Name in print: .....Relationship: .. ..

Biographical Information:

Child's name: .....

Child's date of birth: (Day) ……..(Month) ……..(Year)

Child's age: ……

Child's gender: Male …..... Female ……..

Child's home language: …….

APPENDIX C

Responses to Questions on the Biographical Questionnaire

	N	YES	%	NO	%
2. Did you give birth to your child naturally?	55	44	80	11	20
3. Was your child anoxic (i.e., did s/he lack oxygen) at birth?	54	8	15	46	85
4. Was your child born either prematurely or after more than 40 weeks of pregnancy? If YES, please indicate after how many weeks:	53	13	24	40	76
5. Is your child one of a twin?	55	4	7	51	93
6. Was walking, talking and toilet training normal?	46	38	69	8	31
7. Was feeding development normal?	54	40	73	14	27
8. Has your child ever had Meningitis?	54	5	9	49	91
9. Has your child ever had Encephalitis?	54	1	2	53	98
10. Has your child ever had Convulsions (fits)?	53	1	2	52	98
11. Has your child ever had Concussion?	53	0	-	53	100
12. Has your child ever had Anaemia?	54	1	2	53	98
13. Has your child ever had a very high fever/temperature?	55	50	91	5	9
14. Has your child ever had a head injury where s/he lost consciousness?	53	0	-	53	100
15. Has your child ever had an allergy?	54	5	9	49	91
16. Does your child complain of headaches?	51	3	5	48	95
17. Is your child clumsy?	54	24	44	30	56
18. Does your child have dizzy spells sometimes?	53	2	4	51	96
19. Does your child often have nightmares?	52	21	38	31	62
20. Does your child sometimes fall deeply asleep even though it is not his/her bedtime?	50	46	84	4	16
21. Does your child have temper tantrums regularly?	55	1	2	54	98
22. Does your child wet the bed regularly?	55	37	67	18	33
23. Does your child sometimes stare blankly into space?	52	2	4	50	96
24. Does anyone in your immediate family suffer from epilepsy?	54	6	11	48	89
25. Do you notice a muscle or group of muscles twitching in your child?	52	5	9	47	91
26. Is your child on any kind of medication? If YES, what kind?	51	8	15	43	85

27. Does your child get on well with other children?	51	46	84	5	16
28. Is your child restless and does s/he struggle to concentrate?	53	8	15	45	85
29. Does your child start crying for no apparent reason?	52	12	22	40	78