A NEURODEVELOPMENTAL PROFILE OF INFANTS WITH FETAL ALCOHOL SPECTRUM DISORDER (FASD) IN THE NORTHERN CAPE REGION, SOUTH AFRICA

by

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Declaration

"I declare that *A Neurodevelopmental profile of infants with Fetal Alcohol Spectrum Disorder (FASD) in the Northern Cape Region, South Africa* is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references."

This is a dissertation of limited scope and must be viewed accordingly.

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Ms Leigh-Anne Fourie

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Date

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"Ability is what you're capable of doing. Motivation determines what you do. Attitude determines how well you do it." (*Lou Holtz)*

Prof Denis Viljoen, for allowing me use of the data and constant motivation.

"Do not go where a path may lead, go instead where there is no path and leave a trail."
(*Ralph Waldo Emerson)*

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"A word of encouragement during a failure is worth more than an hour of praise after success." (*Anonymous)*

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(*Louisa May Alcott)*

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"…and then the day came when the risk to remain tight in a bud was more painful than the risk it took to blossom." (*Anais Nin)*

SUMMARY

Fetal Alcohol Syndrome (FAS) is a preventable cause of mental retardation and is the severest category within Fetal Alcohol Spectrum Disorder (FASD). As gestational alcohol exposure affects fetal cognitive functioning, children with FAS present with intellectual deficits. Unfortunately FASD prevalence rates are increasing amongst infants and school-going children. The main goal of this study was to compare the neurodevelopmental subscales of infants diagnosed with FAS, Partial FAS and non- FAS. Seventy-four infants with confirmed FAS, Partial FAS or Non- FAS diagnoses were assessed using the Griffiths Mental Developmental Scale.

Development assessed at 7-12 and 17-29 months of age showed that, regardless of a FAS, PFAS or Non-FAS diagnosis, all infants performed weaker at their assessment at 17-29 months. The Subscales significantly affected included Personal-Social, Eye- Hand Coordination and Performance. The infants with FAS and PFAS displayed the most marked developmental delays.

From this study it can be concluded that there are definite neurodevelopmental profiles for infant's diagnosed with FAS, PFAS and/or Non-FAS, highlighting the significant impact of prenatal alcohol exposure on various aspects of infant development.

OPSOMMING

Fetale Alkoholsindroom (FAS) is ‘n voorkombare oorsaak van kognitiewe gestremdheid en word as deel van die Fetale Alkohol sindroom Spektrum versteuring beskou. Aangesien alkoholiese blootstelling gedurende swangerskap die fetus se kognitiewe funksionering affekteer, presenter kinders met FAS met kognitiewe tekortkominge. Ongelukkig is daar ‘n toename in die FAS syfers by babas en skoolgaande kinders in Suid Afrika. Die hoofdoel van hierdie studie was om die neurologiese ontwikkelingsprofiele van babas met FAS, gedeeltelike FAS (PFAS) en geen FAS (Nie-FAS) te vergelyk. Vier-en-sewentig babas met bevestigde FAS, PFAS en Nie-FAS diagnoses is met dit Griffiths Skale vir Verstandelike Ontwikkeling geassesser.

Ontwikkeling is tussen die ouderdomme van 7-12 maande en 17-29 maande geassesseer, en het getoon dat, ongeag die diagnose van FAS, PFAS of Nie-FAS, alle babas swakker presteer het tydens die tweede assessering op 17-29 maande. Die subskale wat beduidend geaffeteer is, was die Persoonlik-Sosiale, Oog-Hand koördinasie en Handeling subskale. Babas met FAS en PFAS het die grootste ontwikkelings agterstande getoon.

Die gevolgtrekking kan dus in die studie gemaak word dat daar definitiewe neurologiese ontwikkelings profiele vir babas met FAS, PFAS en Nie- FAS bestaan. Die beduidende impak van alkoholiese blootstelling gedurende swangerskap op verskeie aspekte van fetale ontwikkeling word ook hierdeur beklemtoon.

I am not all knowing,
Therefore, I shall not even attempt to be.

I need to be loved,
Therefore, I will be open to loving children.

I want to be more accepting of the child in me.
Therefore, I will with wonder and awe allow children to illuminate my world.

I know so little about the complex intricacies of childhood.
Therefore, I will allow children to teach me.

I learn best from and am impacted most by my personal struggles.
Therefore, I will join with children in their struggles.

I sometimes need refuge,
Therefore, I will provide a refuge for children.

I like it when I am fully accepted as the person I am.
Therefore, I will strive to experience and appreciate the person of the child.

I make mistakes. They are a declaration of the way I am- human and fallible.
Therefore, I will be tolerant of the humanness of children.

I react with emotional internalisation and expression to my world of reality.
Therefore, I will relinquish the grasp I have on reality and will try to enter the world as experienced by the child.

It feels good to be an authority, to provide answers.
Therefore, I shall need to work hard to protect children from me.

I am more fully me when I feel safe
Therefore, I will be consistent in my interactions with children.

I am the only person who can live my life
Therefore, I will not attempt to rule a child's life.

I have learned most of what I know from experiencing.
Therefore, I will allow children to experience.

The hope I experience and the will to live come from within me.
Therefore, I will recognise and affirm the child's will and selfhood.

I cannot make children's hurt and fears and frustrations and disappointments go away
Therefore, I will soften the blow.

I experience fear when I am vulnerable.
Therefore, I will with kindness, gentleness, and tenderness touch the inner world of the vulnerable child.

(Landreth, 2002)

GLOSSARY OF KEY TERMS

Assessment – a process using observation, testing and test analysis to determine an infants strengths and weaknesses to plan, for future intervention programmes (South Dakota Council, 2002).

Cognitive development – The development of intelligence, conscious thought, and problem solving ability that begins in infancy (Dorlands, 2003).

Developmental – pertaining to development (Dorlands, 2003).

Developmental quotient (DQ) – A score obtained from the Griffiths Mental Development Scale (GMDS) that provides a measure of the developmental ability in relation to age (Griffiths, 1996).

Diagnosis – The process of identifying specific mental or physical disorders, in this case Fetal Alcohol Spectrum Disorder (FASD) (South Dakota Council, 2002).

Dysmorphology – a branch of clinical genetics concerned with the diagnosis and interpretation of patterns of the three types of structural defects- malformation, disruption and deformation, associated with prenatal alcohol exposure for this study (Dorlands, 2003).

Failure to thrive – A chronic disorder of infancy and childhood characterized by growth failure, malnutrition and variable degrees of the delay in motor and social development. Possible causes are varied; illness, oral-motor feeding and swallowing disorders, inadequate food resources and problems with parent-child interaction (South Dakota Council, 2002).

Fetus - The unborn offspring in the post embryonic period, after major structures have been outlined in humans, from the 7^{th} or 8^{th} week after fertilization until birth (South Dakota Council, 2002). In this study, focus will be placed on the fetus exposed to maternal alcohol exposure.

Infant – A young human child from birth to 12 months of age (Dorland's, 2003).

Interdisciplinary research team – A team of people from different areas of expertise who observe and test an infant to determine his/her strengths and weaknesses (South Dakota Council, 2002). In this study the diagnostic team are made up of; genetic specialist paediatricians, neurodevelopmental psychometrists, and genetic counsellors.

Mental retardation – Having significantly sub average developmental functioning (refers to scores obtained from a developmental test) existing concurrently with deficits in behaviour and manifested during the development period (South Dakota Council, 2002). For this study, reference will be made of infants falling into the category of Mental retardation due to low scores achieved on developmental assessments.

Microcephaly – Abnormal smallness of the head usually associated with mental retardation (Dorland's, 2003). For the purpose of a Fetal Alcohol Syndrome diagnosis, microcephaly is determined if the size of the head is two standard deviations below the mean.

Syndrome – A set of symptoms that occur together (Dorland's, 2003). For the purpose of this study syndrome refers to the pattern of malformations related to the umbrella term, Fetal Alcohol Spectrum Disorder (FASD).

Teratogen – An agent or factor, in this case alcohol, that causes physical defects in the developing embryo (South Dakota Council, 2002).

Trimester – The three terms or periods of three months into which the nine months of pregnancy can be divided (Dorland's, 2003). Prenatal alcohol exposure damages the fetus at varying degrees during the trimesters.

Palpebral Fissure – The longitudinal opening between the eyelids (Dorland's, 2003), used to make a clinical Fetal Alcohol Syndrome (FAS) diagnosis.

Thin Vermillion Border – A bright red pigment border around the lips (South Dakota Council, 2003), used to make a clinical Fetal Alcohol Syndrome (FAS) diagnosis.

Smooth Philtrum - The vertical groove in the middle of the upper lip (South Dakota Council, 2002), used to make a clinical Fetal Alcohol Syndrome diagnosis.

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CHAPTER ONE

1 INTRODUCTION AND OVERVIEW

1.1 INTRODUCTION

Fetal Alcohol Syndrome (FAS) is the most preventable cause of mental retardation worldwide and the most severe category within the Fetal Alcohol Spectrum Disorder (FASD). Other disorders within the FASD spectrum include: Partial Fetal Alcohol Syndrome (PFAS), Alcohol Related Birth Defects (ARBD) and Alcohol Neurodevelopmental Disorder (ARND). Alcohol is a teratogen, a substance that produces an actual or potentially adverse effect on the developing fetus. Of all the substances of abuse, including heroin, cocaine and marijuana, alcohol produces the most serious neurobehavioral effects on a fetus (Stratton, Howe & Battaglia, 1996:35).

Fetal alcohol syndrome, or (FAS), as it will be referred to through this dissertation, occurs as a teratogenic consequence of excessive maternal alcohol consumption during pregnancy. When alcohol is consumed by a pregnant woman it moves into the blood stream and is carried to all organs and tissues, passing freely through the thin placental membrane that separates the maternal and fetal blood systems thus delivering the alcohol directly to the developing tissues of the fetus. The effects of alcohol can damage the fetus throughout pregnancy and are not isolated to a particular trimester (Church, 2004:1).

For centuries, people in the Western Cape Province have been involved in producing wine which according to May, Gossage, White-Country, Goodhart, Decoteau, Trujilo, Kalberg, Viljoen and Hoyme (2004:1906) have influenced the drinking patterns within this region. One legacy on the Cape's wine farms is the 'dop'-system, the payment of farm workers with alcohol as a substitute for wages.

The "dop" system originated in the early years of colonial settlement at the Cape when indigenous people were encouraged, by the European farm-owners, to work on farms in return for payment with tobacco, bread and wine. This tradition of giving out wine in return for labour became entrenched in farming practice over the next 300 years and formed an important part of the social control exercised over farm labourers (Cape Vineyard from Long Ago, 2006).

The ”dop” system left a legacy of alcohol abuse and dependency, which according to surveys conducted by the Dopstop Association; workers employed in vineyards spent a substantial portion of their salaries on alcohol. Although the “dop”-system has been expelled for several years the frequent, alcohol binge- drinking patterns amongst farm workers are still evident today. More recently informal taverns or “shebeens” found in most townships in South Africa have replaced the “dop” system. These taverns or “shebeens” fulfil the role of a social club, where clients can buy alcohol on credit. This combined with poverty creates an environment where alcohol abuse thrives (Nero, 2001; Viljoen, 2005).

High levels of alcohol abuse and fetal alcohol spectrum disorder (FASD) have been reported in towns and cities not linked to wine-growing industry, such as in De Aar situated in the Northern Cape Province, which may be due to high levels of poverty and unemployment (FASAWARE, 2005). After conducting extensive interviews in De Aar, Nero (2001) comments that the community perceives drinking as a culture rather than a habit, with alcohol forming a key part of socialization. Women in De Aar are aware of the risks associated with drinking alcohol. However, pregnant women are not aware of the direct danger that alcohol poses to their unborn children (Nero, 2001).

Various scientific articles refer to the complex features of Fetal Alcohol Syndrome and more recently the term of Fetal Alcohol Spectrum Disorder, which comprises all the lesser forms of the disorder. Viljoen (1999:958) describes the clinical features of Fetal Alcohol Syndrome as being growth retardation, central nervous system abnormalities, behavioural deviations, characteristic facial dysmorphology and malformations of other organ systems, such as cleft lip, cleft palate and neural tube defects. These primary disabilities present at birth, lead to long-term mental, developmental and behavioural problems (Kodituwakku, Kalberg & May, 2001:197). Partial Fetal Alcohol Syndrome (PFAS) is a diagnosis assigned to individuals with a confirmed alcohol exposure and who present with some of the above-mentioned facial features, as well as evidence of growth deficiency.

A Non-FAS diagnosis is assigned to individuals who do not have confirmed alcohol exposure and who do not display any facial features associated to prenatal exposure.

Mothers may not have to drink substantial amounts of alcohol to endanger their unborn children, as previously believed. Recent studies prove that even low levels of alcohol exposure

during pregnancy can damage various brain regions (FASAWARE, 2005), with affected individuals showing signs of lower levels of intelligence, behavioural abnormalities and poor language assimilation. These disabilities become more apparent in the early to middle childhood years, when children enter into the school system.

Streissguth (in Mattson, Schoenfield & Riley, 2001:187) identifies secondary disabilities as being those that an individual develops as a result of central nervous system (CNS) deficits associated with Fetal Alcohol Syndrome. Some of the most common secondary disabilities are mental health problems, disrupted school experience, alcohol or drug use, legal problems, imprisonment, inappropriate sexual behaviour and dependant living (Streissguth, Barr, Kagan & Bookstein, 1996).

It is important for the reader to note that not all individuals diagnosed with Fetal Alcohol Syndrome will exhibit all the above- mentioned secondary disabilities. However, the researcher is of the opinion that the presence of a primary and/or secondary disability would affect an individual's perception of him/herself thereby influencing his/her interaction with the environment. This viewpoint holds true in understanding some of the cornerstones of Gestalt therapy. As the researcher's interest lies in this field of therapy, key Gestalt concepts will be integrated into this research report.

Perls (as cited in Clarkson & Mackewn, 1996:40) emphasises the interrelationship between the individual and his environment. The individual/ environment field is created, with the individual partly influencing the rest of the field and the rest of the field influencing the individual (Yontef & Simkin, 1989:286). In Perls' holistic field theory, a person's behaviour can only be understood in terms of his/her interdependence with their environment because his/her social, historical, cultural field is intrinsic (Clarkson & Mackewn, 1996:42). Understanding the way humans behave needs to include a sense of the situation of field.
Yontef further adds that in field theory all events and things are created according to the conditions of the field and the interests of the individuals (Yonef & Simkin, 1989:288). When the person or field is disturbed by some need or outside stimulus, the individual begins to distinguish aspects of the field according to his/her own needs or interests. Individuals with Fetal Alcohol Spectrum Disorder (FASD) are influenced by their environment, which often gets them into trouble, as described above, as secondary disabilities.

Awareness is the human ability of being in touch with ones whole field, including the self. (Clarkson & Mackewn, 1996:44). Through this awareness an individual attempts to self-regulate, within the environment. This self-regulation proves difficult for individuals with Fetal Alcohol Spectrum Disorder (FASD) as their self-regulation is often inhibited in the interests of the self or others, never allowing them to maintain equilibrium.

Interaction between the self-and/ environments entails some kind of exchange across the self-boundary. Contact is the awareness of and behaviour towards the assimilation or rejection of that which is needed to satisfy a need (Clarkson & Mackewn, 1996:55). Through contact people grow and change. Individuals with Fetal Alcohol Spectrum Disorder (FASD) are easily persuaded and trusting allowing for more contact over the self –boundary, influencing the development of secondary disabilities associated with FASD. Often in fulfilling the dominant need, gaps emerge with individuals with FASD, creating an inability of choosing, using action and the organisation of ourselves as well as the environment. It is of the researcher's opinion that most individuals with FASD do not organise their environment, affecting their perception of the self, as well as all behaviours.

Early child development involves a natural interdependence between the infant and adult, in which the infant is not isolated and helpless because he is cared for by the adult (the environmental support), who is an integral part of the same interconnected field (Clarkson & Mackewn, 1996:62).

Within South Africa, three communities have been evaluated by the Foundation for Alcohol Related Research (FARR). Prevalence rates of Fetal Alcohol Spectrum Disorder in the Western Cape in school entry children aged 7 years within high-risk communities varies from between 45-75 per 1000 (May, Brooke, Gossage, Croxford, Adnams, Jones, Robinson & Viljoen, 2000:1908), while in Gauteng, rates of 22 per 1000 have been reported (Viljoen, 2003a: 660). Research in the community of De Aar in the Northern Cape Province reveal a Fetal Alcohol Syndrome prevalence of up to 122 per 1000 (South African- US Consultation, 2003), the highest reported figure worldwide.

The following Table 1.1 International prevalence rates for Fetal Alcohol Syndrome.

Table 1.1 International prevalence rates of Fetal Alcohol Syndrome (per 1000)

COUNTRY	FAS RATE Per 1000
USA (Abel & Sokol, 1991)	**0.33 - 2.2**
France (Dehaene, Sameille-Vilette, Boulnager-Fasquelle, Subtil, Delahousse & Crepin, 1991)	**1.22**
Sweden (Olegard, Sabel, Aronsston, Sandin, Johansson, Carlsson, Kyllerman, Iverson & Herbeke, 1979)	**1.33**
Sectors of the Native American Indian population (May, 1991)	**8**
An isolated Canadian Indian community (Robinson, Conry & Conry, 1987)	**125**

The findings in Table 1.1 have been included to illustrate the first prevalence rate studies conducted on Fetal Alcohol Syndrome (FAS) internationally. The researcher has included these references and research rates so as to create a baseline understanding of the Fetal Alcohol Syndrome (FAS) rates worldwide. When these findings are compared to the above-mentioned prevalence rates found in South Africa, the extent of the problem faced in South Africa can be appreciated.

Although both Fetal Alcohol Syndrome and the larger Fetal Alcohol Spectrum Disorder can be prevented, they remain the leading cause of mental retardation (Warren & Bast, 1988:638-642). The ever- increasing rates of Fetal Alcohol Syndrome have made it one of South Africa's top four priority genetic conditions, which include Down Syndrome, Neural Tube Defects and Albinism (Dept of Health Policy Guidelines, 2001:18).

International and local organizations such as the Centre for Disease Control (CDC), the Foundation for Alcohol Related Research (FARR), National Health Laboratory Services (NHLS) and the University of the Witwatersrand have been working together conducting Fetal Alcohol Syndrome epidemiological and prevention studies in South Africa thereby increasing the awareness of Fetal Alcohol Syndrome. A national Fetal Alcohol Syndrome Awareness Programme was launched in November 1998 by the Department of Health to assist in the education and awareness of Fetal Alcohol Syndrome amongst all communities in South Africa (Dept of Health, 2001). The recent airing of a Special Assignment- programme on 17 January 2006 (SABC 3, 2005) reported on two regions in crises, namely the Western Cape and Northern Cape Provinces. Awareness is achieved through the dissemination of extensive and comprehensive research findings, which in turn can be used to implement the necessary prevention programmes.

Mouton and Marais (1996:192) agree that the quality of research findings depend directly on the research methodology followed. For this reason it is necessary for the researcher to detail the way in which the research was designed, ordered and implemented.

1.2 TYPE OF RESEARCH

In order for research to provide knowledge, acceptable methods of deriving data need to be utilised. As cited by Wilson in Mouton and Marais (1996:8), when the aim of the researcher is to generate knowledge rather than to solve problems a **basic research approach** is followed. It is necessary for the researcher at this point to clarify this research as being **basic or pure** in nature, as empirical observations are derived and then integrated into the formulating of a theory. The type of research serves merely as a guideline in determining the research approach and design followed through the research process.

Leedy (in Fouché & Delport, 2002:78) refers to the research process as being circular in structure. It begins with a problem, and ends with that problem resolved or described. The concept of a neat, circular research model is deceptive, as research by nature is spiral, taking on a "helix" formation. Babbie and Mouton (2001:72) add that empirical research conforms to a standard logic, which they refer to as the ProDEC framework. ProDEC refers to four key elements standard for all forms of empirical research, namely: a research problem (Pro), research design (D), empirical evidence (E) and conclusions (C). Authors differ in their views of the research process, with Fouché and Delport (2002:85) stating that researchers may need to individualise their research process, adapting the social research model to their specific project needs. The researcher has adapted the above- mentioned PRODEC model and the research process to detail this research study. The following section illustrates the research process used.

1.3 THE QUANTITATIVE APPROACH TO THE RESEARCH PROCESS

A systematic approach and logical procession of ideas are essential in the progression through the research process. For this reason, it is necessary for the researcher to identify the paradigm or roots of approach used in this research study. A quantitative approach has been used for this study, which assists in determining key elements present within a comprehensive, spiral research process. The quantitative paradigm is based on positivism, aiming to measure the social world impartially through the predicting and controlling of human behaviour (Cresswell,

1994:1-2). Mouton and Marais (1990:155-156) identify quantitative research characteristics as being highly formalised with clear defined ranges and controlled explicitly.

The following schematic representation Table 1.2 serves to assist the reader in understanding the quantitative research steps followed by the researcher, in this research process.

Table 1.2 The Research Process

1.3.1. Initial Planning and Problem Formulation	1.3.2Formal formulations	1.3.3 Implementation of empirical research	1.3.4 Processing of data, interpretation and integration of results
Identification of research theme	**Literature Review**	**Process research data**	**Data Analysis**
Formulation of a research problem/ hypothesis	**Research Design**	**Measuring Instrument Implemented**	**Statistical Representations of results**
Goals and Objectives	**Methods of data collection**		**Integration of results and theory**
	Sample selection		
Adapted from Fouché and Delport, 2002:83-89			

The following serves as a theoretical description of each of the steps used during the research process, as included in the above schemata.

1.3.1 INITIAL PLANNING AND PROBLEM FORMATION

1.3.1.1 Identifying a Research Theme

In the planning of a research study, the initial step is in the identifying of a research theme. This often proves difficult with research being conducted for various reasons. Mouton and Marais (1996:34) state that curiosity about an interesting behaviour or puzzling phenomenon often motivates a research process. It is also necessary for the researcher to consult previous or existing literature relevant to the theme of the intended research. The literature review is crucial in the research process. Not only does it allow for the general understanding of the research topic, but can serve in determining research problems and possible hypotheses. Most literature pertaining to this research, were obtained from recent journals with additional information from books, articles, conference proceedings, manuals and international databases. The sources used for the study are included in the reference list.

A great deal of research has been conducted on the diagnosis of Fetal Alcohol Syndrome at a clinical level, as well as the evaluation of the cognitive and behavioural aspects of adults and children with Fetal Alcohol Syndrome. Until recently, most research in this neurobehavioral field has focused on adults and school-going children diagnosed with Fetal Alcohol Syndrome, although a study conducted by Streissguth (1997) reported a 100% failure rate in detecting Fetal Alcohol Syndrome in infancy. Even though infant diagnoses have been made (Jones & Smith 1973; Ernhart, Wolf & Linn, 1985; Van der Leeden, Dongen, Kleinhout, Phaff, De Groot, De Groot & Hessling, 2001; Stoler & Holmes, 2004) the clinical features at birth remain less obvious than those present in later years of life.

Although the above -mentioned study was based in the US, it can be assumed that in South Africa, a developing country, many infants with Fetal Alcohol Syndrome or another Fetal Alcohol Spectrum Disorder, remain undetected.

As cited by Mouton (in Fouché, 2002:96) an obvious source of knowledge relating to the choice of theme is ones *contact with the external world* and the *direct observation* thereof. As a member of a multi-disciplinary team conducting prevention studies in the Northern Cape, initiated by the Foundation for Alcohol Related Research (FARR), the researcher has gained valuable knowledge in the field of Fetal Alcohol Syndrome Disorder.

Fouché and Delport (2002:86) add that one must not discount the researchers personal experiences and interests, which contribute to the final theme chosen. The researcher's personal involvement and interest in the administering of the neurodevelopmental assessments to infants, as well as the ability of accessing some of South Africa's most high-risk Fetal Alcohol Syndrome Disorder areas, allowing for the collection of the data, also motivated this study.

When working in the field of research, previous investigations generate new ones. Extensive research, done on the Fetal Alcohol Syndrome Disorder, focuses on smaller samples of affected adults or children. Previous epidemiological research conducted in the Northern Cape region, proves that the De Aar community reflects the highest reported rates of Fetal Alcohol Spectrum Disorder in the world, allowing for a contained, research population. It was only through this previous research conducted on school-going children in De Aar, that a need emerged to identify Fetal Alcohol Spectrum Disorder in infancy.

Researchers, parents and teachers of infants/ children with Fetal Alcohol Spectrum Disorder lack insight into the areas of infant neurodevelopment, which if identified and stimulated in early infancy, could reduce later onset secondary disabilities such as increased risk of mental health problems, disrupted school experiences and criminal conduct as they approach adolescence (Streissguth, *et al.,* 1996: 94).

This Fetal Alcohol Spectrum Disorder project forms part of the first published, population-based data reporting the incidence of Fetal Alcohol Spectrum Disorder in infants aged between 7 – 29 months, as well as one of the first studies highlighting the neurodevelopmental profiles of these infants within a Gestalt perspective.

It is necessary for the researcher to modify the general topic into a more manageable, researchable problem. Before one can conduct a quantitative research study, a clear definition of the research problem must be formulated from the selected research topic. The following seeks to formulate the problem pertaining to this specific research study.

1.3.1.2 Formulation of Research Problem/Hypothesis

Research gives rise to the development of a research problem, which takes on the form of a testable hypothesis. Fouché (2002:106) adds that when using a quantitative approach, as used in this research, a research problem and hypothesis are formed. Research problems are derived from the following three sources namely, clinical situations, literature or from past theories (Brink, 1999:58).

According to Mouton (2001:91) both the problem and research question relate directly to the goal of the study. The research gives rise to the development of a research problem, which takes on the form of a testable hypothesis (Fouchė & Delport, 2002:87). At present there are no profiles detailing the neurodevelopmental subscales implicated in infants affected by the Fetal Alcohol Spectrum Disorder. Existing profiles focus on the clinical characteristics of both infants and children as well as cognitive and behavioural characteristics of older children. The creation of a neurodevelopmental profile of an infant with Fetal Alcohol Spectrum Disorder would highlight specific delays in the development of the infant. This would make the detection of developmental delays more obvious for caregivers and mothers, allowing for the early implementation of appropriate intervention programmes thereby decreasing the onset of later secondary disabilities.

The following research problem was formalised:

How do the neurodevelopmental subscales differ in infants diagnosed with Fetal Alcohol Spectrum Disorder at various developmental levels?

The creation of the research problem then gives rise to the creation of more concrete research objectives, questions or hypotheses.

As cited by De Vos (2002:36) a hypothesis refers to a positive statement made about the relationship between variables. Once the researcher empirically tests or evaluates the above research problem it becomes a hypothesis. The hypothesis statement contains two or more variables that are measurable and specify how the variables relate to each other.

The following hypotheses guided this study:

Hypothesis 0*:* ***The neurodevelopmental profile of a Fetal Alcohol Spectrum Disorder affected infant does not illustrate more delay at the 17-29 month assessment compared to the 7-12-month assessment.***

Hypothesis 1: ***The neurodevelopmental profile of a Fetal Alcohol affected infant illustrates more delay at the 17-29 month assessment compared to the 7-12 month assessment.***

Through the clarification of the problem, clear goals and objectives are crystallized. Hereby the research process is initiated.

In understanding the research conducted, it is important that the variables being measured be described. The research design, sampling techniques and data collection methods are discussed accordingly.

Burns and Grove (in Brink, 1999:93) describe variables as being qualities, properties or characteristics of persons, things or situations that change or vary. The **independent variable** influences other variables. In this research the independent variable is the infant with or without Fetal Alcohol Spectrum Disorder.

The **dependent variable** reflects the outcome variable, the problem that must be worked on in response to the independent variable (Strydom, 2002:152). In this study, the dependent

variables are the neurodevelopmental scores. These developmental scores vary according to the age of the infant, and whether or not there is a diagnosis within the Fetal Alcohol Spectrum Disorder.

The variables clarify what is being measured and allow a means of analysing the relationship between them, however the goals and objectives indicate the intended result of the study. The following serves as a description of these goals and objectives.

1.3.1.3 Goals and Objectives

Research goals are essential in providing clarity of the intended outcomes of research (De Vos, 2002:404). In Fouché (2002:108) researchers discuss the goals of research as being, **exploratory, descriptive and explanatory** in nature. This research study draws on both **exploratory research** to gain insight into the neurodevelopment of infants with FASD and **descriptive research**, presenting specific relationships between the variables of the research.

The **main goal** of this research study is to evaluate the neurodevelopmental subscales of infants diagnosed with a Fetal Alcohol Spectrum Disorder diagnosis of either; Fetal Alcohol Syndrome, Partial Fetal Alcohol Syndrome or non- Fetal Alcohol Syndrome, at different stages of infancy.

Objectives, as explained by Fouché (2002:107), are seen as steps taken in achieving the desired research goal. The following objectives have been identified:

- To provide a theoretical foundation exploring, describing and reviewing the features associated with Fetal Alcohol Spectrum Disorder through a literature review including clinical diagnosis of Fetal Alcohol Spectrum Disorder, cognitive, behavioural and sensory implications associated with Fetal Alcohol Spectrum Disorder and the importance of a Fetal Alcohol Spectrum Disorder diagnosis at infancy.
- To provide an integration of Gestalt concepts with reference to the developmental phases of infants.
- To highlight delays in the developmental scales of Fetal Alcohol Syndrome, Partial Fetal Alcohol Syndrome and Non-Fetal Alcohol Syndrome infants over two assessments at 7-12 months of age (First Assessment) and 17 –29 months of age (Second Assessment). Analysis of these infant developmental distributions would allow for the creation of longitudinal developmental profiles.

- To analyse these infant developmental distributions to allow for the creation of longitudinal developmental profiles.
- To describe the results comprehensively, in order to make recommendations.

Motivated by the above objectives, a research study was conducted on infants in De Aar, highlighting their neurodevelopmental performance. The following section seeks to clarify the formal process used in the creation of the workable research design used.

1.3.2 FORMAL FORMULATIONS

Once the initial planning and problem formations have been decided upon, the researcher focuses on the proposed research (De Vos, 2002:47). The following seeks to understand the thought processes associated with the research methodology.

Cross and Brodie (in Strydom, 2002:255) state that research methodologies are sets of procedures or methods used in conducting scientific investigations. According to Strydom (2002: 255), it is important that the research methodology be described comprehensively, giving the reader clarity relating to all research steps used in the study.

1.3.2.1 Literature study

It is important for the reader to note that the following categories of the Fetal Alcohol Spectrum will be referred to throughout the research report, but are described in detail in Chapter Two:

- Fetal Alcohol Syndrome (FAS)
- Partial Fetal Alcohol Syndrome (PFAS) and
- Non-Fetal Alcohol Syndrome (Diagnosed as not having FAS)

The prevalence of Fetal Alcohol Syndrome is increasing both locally and internationally. The awareness of this preventable disorder has allowed for the commencement of various studies in South Africa, most of which include the knowledge and skills of the Foundation for Alcohol Related Research (FARR). As discussed above, still very little is known of the developmental delay amongst infants with Fetal Alcohol Syndrome. This research serves to highlight some of these developmental delays in infants affected by Fetal Alcohol Syndrome, Partial Fetal Alcohol Syndrome and infants with no signs of a Fetal Alcohol Syndrome (Non-FAS).

The known high-risk community of De Aar allows for a controlled environment from where research can be done. High Fetal Alcohol Syndrome prevalence rates, found by Viljoen and colleagues (Viljoen, 2003b), highlight the need for an intervention programme, creating an awareness of FAS. It is of the researcher's experience, working in this community, that all mothers be trained in mother- and- child interaction. Through the development of stimulating programmes, both mother and child will feel self-empowered and strengthen their interaction with their field.

Three main disciplines were integrated in this research, namely: medical, psychological and developmental. Key Gestalt therapy concepts were included in this research, adding to the uniqueness of the research as no other research studies focusing on FAS have approached the research from the Gestalt frame of reference.

1.3.2.2 Consultation with experts

To verify the literature collected, the researcher consulted with specialists in the fields of interest, with respect to the purpose of the intended research. The following experts were consulted:

- Within the field of Fetal Alcohol Spectrum Disorder (FASD), the Head of Human Genetics Department, University of the Witwatersrand, Prof Denis Viljoen was consulted. Prof Viljoen created the Foundation for Alcohol Related Research (FARR) as a Non-Governmental Organisation (NGO) in 1995 to address issues specifically related to Fetal Alcohol Syndrome (FAS).

- Prof Chris Molteno was consulted on the neurodevelopmental functioning of infants. Prof Molteno is a Neurodevelopmental Paediatric specialist within the discipline of Psychiatry at the University of Cape Town, and has many years experience in the administering and scoring of the Griffiths Mental Developmental Scales, used in this research.

- The Gestalt perspective was integrated into the research study through the assistance of various lecturers at the Centre of Play Therapy and Training, Huguenot College in Wellington.

- Sister Mabel Nero (FARR, De Aar project coordinator). Sister Nero's nursing background and years of working with women in the De Aar community allowed for a comprehensive understanding of the elements associated with alcohol abuse in this community.

1.3.2.3 Research Design

Mouton (2001:55) defines a research design as being a plan or blueprint of how one intends conducting the research. Selltiz and colleagues as cited in Mouton and Marais (1996:50) define a research design as being, "the arrangement of conditions for the collection and analysis of data in a manner that aims to combine relevance to the research purpose…"

The plan or structure of this study follows a non-experimental, correlational, ex -post facto design. It is important for the reader to understand that the type of data utilized is retrospective in nature (Brink, 1999:10), as the variables being measured form part of a larger study conducted by the Foundation of Alcohol Related Research (FARR), National Health Laboratory Services (NHLS) and the University of Witwatersrand.

1.3.2.3.1 Non-Experimental Design

A non- experimental design was utilised for this research to describe the phenomenon, and to explore and explain the relationship between specific variables, selected from the retrospective study conducted by FARR (Brink, 1999:10). Although lack of experimental control makes these designs weaker in determining a cause and effect, they generate knowledge in settings where it would be unethical to manipulate only one variable, as in the case of infants with Fetal Alcohol Syndrome or Partial Fetal Alcohol Syndrome.

1.3.2.3.2 Correlational Design

Correlational research forms part of the descriptive approach, involving ways of describing relationships between variables using both observation and measurement. De Vos, Fouchė and Venter (2002:242) state that this technique is best suited for numerical measurements classified into categories, assisting in the quantifying of the relationships. Correlation involves a direction, for this study the longitudinal, correlational research design was used as repeated measurements were taken over a period of time.

1.3.2.3.3 Ex Post Facto Design

Ex post facto or "after the fact" designs (Brink, 1999:110) are frequently referred to as correlational designs. The term implies that an event has taken place (retrospective study), and that the investigator seeks to understand and explain an observed relationship between two variables. As described above the larger, prevention study had taken place, identifying infants with Fetal Alcohol Syndrome (FAS). This initiated an interest in the neurodevelopmental profiles of infants with FAS and their overall developmental performance over various stages in infancy.

1.3.2.4 Methods of Data Collection

The process of how data was obtained is paramount to the readers understanding of the research study. The larger retrospective project, conducted by FARR, was initiated with a view to establishing prevalence rates amongst infants in high-risk community. The researcher chose to use the data from these prevalence diagnoses and the neurodevelopmental assessments in order to distinguish between the various Fetal Alcohol Spectrum Disorder developmental profiles.

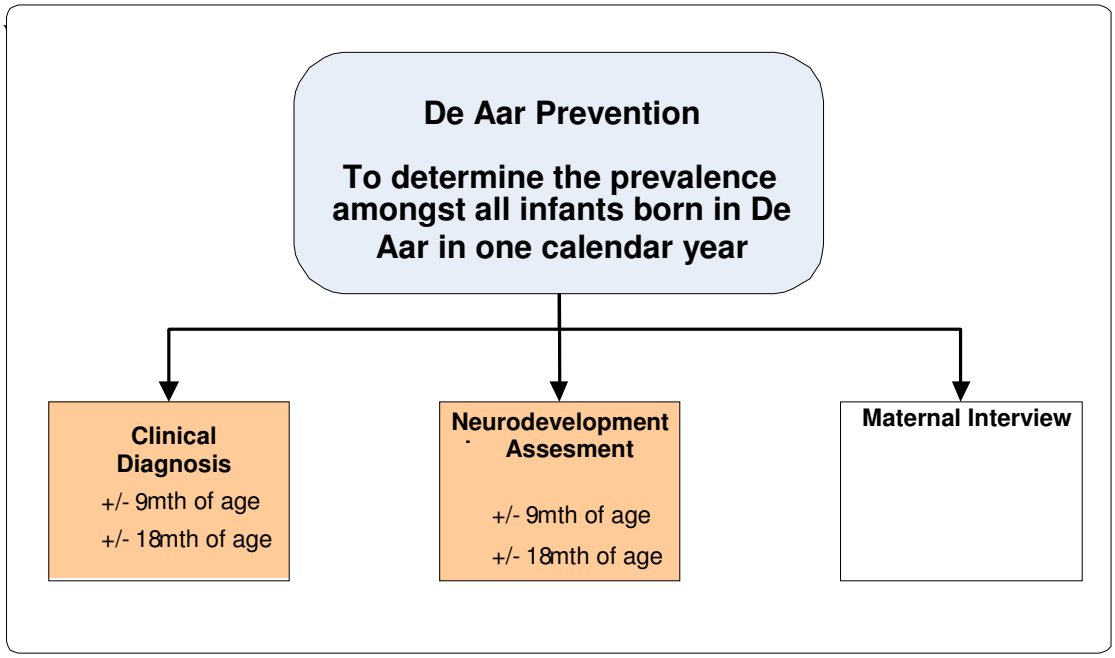


Figure 1-1 The Retrospective Prevention Project

In the above

Figure 1-1 the larger, retrospective study is put into context for the readers understanding of this 'prospective' research project.

A clear illustration of the use of triangulation is evident in Figure 1.1. Triangulation refers to the use of different instruments, angles or viewpoints providing insight about relationships (De Vos, 2002:341). Researchers use multiple measures to gain more information of the same population. In this retrospective study infants were assessed for a Fetal Alcohol Spectrum Disorder (FASD) using three different measures:

- A Clinical Evaluation,
- A Neurodevelopmental Assessment and
- A Maternal Interview

1.3.2.5 Description of Universe, Sample and Sampling Methods

De Aar, situated in the Upper Karoo of the Northern Cape Province, is the capital of the region with a population of 27650 people. With an illiteracy rate of 20% and lack of employment options, only 5845 individuals are registered as being employed, many in part-time jobs and 3309 (36%) unemployed individuals. The ethnic composition of the town is diverse and the groups have been divided as follows for statistical purposes; approximately 59% of individuals are mixed ancestry (coloured), 24% are black and 18% fell into other, including Caucasian, Asian, and Indian ethnicities (Statistics SA, 2005).

Previous epidemiological studies conducted by Viljoen and colleagues (Viljoen, 2003b) on school-entry children, illustrated this population as being the most heavily affected community with FAS investigated in South Africa thus far. Of the 534 children clinically examined, 65 (12%) showed signs of Fetal Alcohol Spectrum Disorder, with 55 (10%), of those being diagnosed with complete Fetal Alcohol Syndrome (FAS).

It is important for the reader to note that even children not presenting with the classic Fetal Alcohol Syndrome features, as described in Chapter Two, may still be partially affected by alcohol related birth defects. This implies that as many as 50 % of children from high- risk areas have some alcohol stigmata (FASAWARE, 2005).

1.3.2.5.1 Universe and Population

A universe, as defined by Arkava and Lane (in De Vos, 2002:198) refers to all potential subjects who possess the attributes of interest to the researcher. The universe represents all infants born in De Aar in the Northern Cape Region. The terms ‘universe’ and ‘population’ are

often used inter-changeably, with Strydom and Venter (2002:199) defining population as being the totality of persons, with in which the research problem has occurred. For the purpose of this research study, the population refers to infants aged 7-29 months of age born in De Aar in the Northern Cape.

1.3.2.5.2 Sample and Sampling Methods

A sample as defined by Seaberg (in Strydom &Venter, 2002:199) is a small portion of the total set of persons that together comprise the subject of the study. The sample and data for this current study were collected from the larger retrospective study conducted by FARR. Infants born within one calendar year, made up the retrospective sample. Birth records for the years 2002-2003 were collected from the local hospital and mothers with infants born in the above sample were invited to take part in the study. An informed parental consent was obtained for this study approved by the Ethics Committee of the University of Witwatersrand **M01-11-20** (see Appendix 1).

Of the **550** infants born in De Aar in the years 2002-2003, **398** consented to being part of the study and had a clinical examination at their first visit at approximately 7-12 months of age. Neurodevelopmental assessments were administered on **389** of these infants, **9** of whom refused neurodevelopmental assessments. Infants clinically diagnosed as having Fetal Alcohol Syndrome, Partial Fetal Alcohol Syndrome or being a Non-Fetal Alcohol Syndrome case were invited back at approximately 17-29 months of age for a second clinical examination. Of the 84 infants who received a clinical follow-up evaluation, only **74** of these had the follow-up neurodevelopmental assessment (n=74). The decrease in numbers can be explained due to high rates of infant mortality between 12 and 17 months of age, maternal deaths, and participants moving from De Aar or refusal to participate in further studies.

1.3.2.5.3 Non-Probability Sampling Method

A **non-probability sampling** method was used for this neurodevelopmental study, as participants were not selected randomly (Brink, 1999:134-135). Due to the clinical nature of the retrospective study a clinical diagnosis was needed to classify infants into various Fetal Alcohol Spectrum Disorder categories, so as to compare their neurodevelopmental quotients. As the sample for the current study was with a purpose or specific characteristic in mind, namely a Fetal Alcohol Spectrum Disorder diagnosis, the **purposive sampling** method was utilised. As cited in Strydom and Venter (2002:207) Singelton describes purposive samples as

comprising of elements that contain the most typical attributes of the population, in this case, Fetal Alcohol Spectrum Disorder diagnoses of the infants clinically examined as part of the retrospective study.

1.3.2.5.4 Identification of Sampling Problems

Problems encountered during the sampling procedure were:

- Infants not born at the local De Aar hospital were not included in the study.
- Many mothers came from surrounding towns to the De Aar hospital to give birth, therefore were not residents of De Aar. For that reason the initial population of births in De Aar was larger than the numbers of infants aged 9 months approached.
- A small number of families with infants born in the calendar year, 2002-2003 had moved from De Aar to other towns or provinces since the birth of their child.
- Due to high levels of infant mortality in the Northern Cape, 53.6 per 1000 of the infants die (Statistics SA, 2005).
- Unwillingness to participate
- Incorrect residential information from birth records at the local hospital

1.3.3 IMPLEMENTATION OF EMPIRICAL RESEARCH

Delport (2002:165) explains that quantitative data collection methods make use of measuring instruments, to obtain valid and reliable data. Measurement can therefore be described as being the process of converting abstract concepts into specific measurements by assigning numbers in accordance to specific rules (Delport, 2002:166). The following describes the neurodevelopmental instrument used in assessing an infant's developmental quotient (DQ).

1.3.3.1 The Griffiths Mental Developmental Scale (GMDS)

The Griffiths Mental Development Scale (GMDS) assesses the mental development of infants and young children. Mental development refers to the individual progression at which the growth and maturation of a child's attributes and abilities takes place (Griffiths, 1954).

The original Griffiths Scales of Mental Development (GMDS) published in 1954 covering the first two years of life encompassed only five subscales. In the 1960's an extension to the original scales, allowed for the inclusion of a sixth subscale permitting for a more holistic assessment of children's (2 years-8 years) development.

Gestalt theory states the importance of studying nothing in isolation, with all aspects being interrelated (Yontef, 1993). Ruth Griffiths believed in this concept when understanding mental development. As cited in, Barnard, Knoesen and Kotras (2004:2) both Griffiths and Green (1997) argued for the integration of social and emotional developmental factors as contributing to an individual's overall mental development.

The Griffiths Mental Developmental Scale (GMDS) is described as a developmental test rather than an intellectual one, assessing developmental abilities across infant and childhood years to the age of eight. Both individual and collective possibilities of learning are measured over five or six subscales (Luiz *et al*., 2004). Researchers agree that when assessing an individual's mental development, a full investigation of their motor, social and cognitive abilities should be observed and tested (Bondurant-Utz & Luciano, 1994; Meisels, 1996; Nuttal, Romero & Kalesnik, 1992). The advantages of using the Griffiths Mental Developmental Scale (GMDS) over a battery of tests are that each subscale has been standardised on the same population, and therefore a comparison across a range of fields for the same child is possible, a key factor in maintaining reliability and validity.

Luiz and colleagues (2004:3) refer to the wide use of the GMDS in international research studies in Canada, France, Germany and in South Africa (Luiz, Foxcroft & Stewart, 2001:73) proving its established reliability and validity. Previous research concludes that poor scores on the Griffiths scales are good predictor's of future impairment at school going age (Barnet, Guzetta, Mercuri, Henderson, Haataja, Cowan & Dobowitz, 2004:637-643).
This confirms that the use of the Griffiths scales in early infancy could alert one to specific domains for future developmental delay and may form a good prediction of school performance in later years.

The Griffiths Mental Developmental Scale (GMDS) consists of the following five subscales – Locomotor, Personal-Social, Speech (Language) and Hearing, Eye and Hand Co-ordination and Performance used from Birth to 2 years. A sixth subscale, Practical Reasoning is included in the Revised- Griffiths Mental Developmental Scales (GMDS-R) on children aged 2 years to 8 years of age (Luiz *et al.,* 2004). For the purpose of this study the GMDS was administered to infants at their First Assessment, aged 7-12 months. On their second assessment at 17-29 months of age, if infants were 24 months of age or older, the GMDS-R was administered.

The following table serves to describe each subscale adding to the reader's understanding of both the instrument of measurement and the *ordinal scales* of development being measured in this research.

Table 1.3 Description of the Griffith's Mental Developmental Subscales

Scale	Description
A- Locomotor Scale	This subscale allows the examiner to assess an infant's gross motor skills including his/her ability to balance, and to co-ordinate and control movements.
B- Personal-Social Scale	This subscale assesses an infant's proficiency in the activities of daily living, his/her level of independence and his/her ability to interact with other children.
C-Speech & Hearing Scale	This subscale allows the examiner to assess an infant's receptive and expressive language.
D-Eye/Hand Coordination Scale	This subscale assesses an infant's fine motor skills, his/her manual dexterity and his/her visual perception skills
E- Performance Subscale	This subscale allows the examiner to assess an infant's manipulation skills including his/her speed and precision of functioning.
F- Practical Reasoning Subscale	This subscale assesses a child's ability to solve practical problems, his/her understanding of basic mathematical concepts and questions about moral and sequential issues.

More detail on the administering of the Griffiths Mental Developmental Test will be discussed in Chapter Four.

1.3.4 PROCESSING OF DATA, INTERPRETATION AND INTEGRATION OF RESULTS

The processing of data, interpretation thereof and the integration of the results will be discussed in Chapter Four and Chapter Five, to maintain the flow of the research report.

1.4 THE FEASIBILITY OF RESEARCH

As the researcher works in the field of Fetal Alcohol Syndrome as the FAS Project Coordinator for the Foundation for Alcohol Related Research (FARR), access to the De Aar community through the larger retrospective, prevention programme was possible. The multi-disciplinary team of expert paediatricians, genetic counsellors, research psychologists and community

health workers assisted in the overall progress of the study. From past epidemiological research in De Aar on older children, it was evident that children should be diagnosed with Fetal Alcohol Syndrome as early as possible, allowing for individual and family inclusion into early intervention programmes. Finally, mothers with one child affected by Fetal Alcohol Syndrome, have a high risk of producing another Fetal Alcohol Syndrome affected child (Viljoen, 2005) highlighting the need for appropriate intervention and education-based programmes.

1.5 ETHICAL CONSIDERATIONS

Anyone involved in research should be aware of general, ethical agreements highlighting what is acceptable in scientific research (Babbie & Mouton, 2001:47). Strydom (2002:63) defines ethics as being a set of moral principles suggested by an individual or group, which are widely accepted. These principles offer rules of appropriate conduct towards experimental subjects and respondents.

Ethical principles, in any field of research, must be maintained as they serve as standards on which each researcher should evaluate his conduct. This research sought to maintain all ethical principles of client autonomy, anonymity and confidentiality. Permission to use the data gathered during the retrospective prevention phases was obtained from the Principle Investigator, Prof. Denis Viljoen. Application to the Human Research Ethical Committee (Medical) of the University of the Witwatersrand was undertaken prior to commencing with the study for ethical clearance was granted (Appendix 1) as well as a clearance certificate issued from the Department of Health (Appendix 2) in the Northern Cape.

Informed consent was obtained from all participating parents/caregivers, after explaining the voluntary nature of their involvement. Parents/caregivers could withdraw from the study at any stage without any detrimental effects on themselves or their infants.

The issue of confidentiality was discussed with each participant, regarding both their personal information and data derived from the clinical diagnosis and neurodevelopmental assessments. Each participating infant in the study was allocated a Study identity number that was used in all analyses. A multi-disciplinary team comprising of genetic clinicians, neurodevelopmental psychometrists and genetic counsellors were appropriately trained and deemed competent to undertake the proposed investigation.

1.6 DEFINING MAIN THEMES

1.6.1 FETAL ALCOHOL SPECTRUM DISORDER

The adverse effects of alcohol on the developing human represent a spectrum of structural irregularities and behavioural and neurocognitive disabilities, termed fetal alcohol spectrum disorder (Hoyme, May, Kalberg, Kodituwakku, Gossage, Trujillo, Buckley, Miller, Aragon, Khaole, Viljoen, Jones & Robinson, 2005:6). Children at the severe end of the spectrum, who present with all major diagnostic components, are defined as having ***Fetal Alcohol Syndrome (FAS)***. The following categories as discussed in detail in Chapter Two, highlight the varying failures in normal fetal development due to maternal alcohol consumption. A ***Partial FAS (PFAS),*** diagnosis is assigned to infants with a confirmed alcohol exposure, and who present with some of the facial features of FAS and either evidence of growth deficiency, CNS neurodevelopmental abnormalities, or a complex pattern of behavioural and cognitive abnormalities ***Alcohol Related Birth Defect (ARBD)*** applies to those individuals with a confirmed heavy prenatal alcohol exposure and one or more congenital abnormalities, usually cardiac, skeletal, renal, ocular or auditory (Hoyme *et al.,* 2005:6). ***Alcohol Related Neurodevelopment Disorder (ARND)*** can be applied to individuals with a confirmed heavy alcohol prenatal exposure that displays measurable, albeit subtle neurodevelopmental deficits compared with FAS (Hoyme *et al*., 2005:39-47).

For the purpose of this study focus will be placed on the following two categories found within the larger Fetal Alcohol Spectrum Disorder, due to their high prevalence rates in the De Aar community: ***Fetal Alcohol Syndrome*** (FAS) and ***Partial FAS*** (PFAS).

1.6.2 INFANT DEVELOPMENT

The term infant describes a young human from birth to 12 months of age (Dorland's, 2003). The early years of a child's life are crucial for cognitive, social and emotional development (Robertson, 1991:246). Infants grow, develop, and learn through interaction with their environments where their social, emotional and educational needs are met. The development of an infant is more than just physical, it includes development over social, emotional, locomotor, vision, hearing and speech and cognitive domains of growth (Centre for Disease Control, 2005).

For the purposes of this study infant development will refer to the maturity of an infant over various domains; Locomotor, Personal-Social, Speech and Hearing, Eye-Hand Coordination and general performance.

The hypothesis for this study seeks to test that developmental delay, as discussed below, deteriorates as an infant with a Fetal Alcohol Syndrome or Partial Fetal Alcohol Syndrome diagnosis matures. By including infant maturity into the study the reader is reminded of the normal process of development and in so doing highlighting any growth delays associated with prenatal alcohol exposure.

1.6.3 DEVELOPMENTAL DELAY

Skills such as walking, smiling, waving "good-bye" and speaking are maturity milestones. When a child does not reach these milestones at the same time as other children of the same age, it is referred to as a developmental delay or disability (Molteno, 1991:36). These delays can impact future advancement of domains such as speech and language, learning and/or behavioural problems (Centre for Disease Control, 2005).

For the purpose of this study, developmental delay refers to specific milestone delays by infants at two developmental stages; 7-12 months of age and 17-29 months of age over various growth domains.

1.6.4 GESTALT THERAPY

Perls, the main founder of Gestalt Therapy believed in working within a phenomenological framework. He placed inter-and intrapersonal contact, and its disturbances, at the centre of psychotherapeutic practice. From his perspective, the therapist enters the therapeutic relationship in a personal manner. Feelings are an intrinsic part of contact, and lively awareness of impulses, feelings and needs facilitate the clients attaining satisfaction (Perls, 1973). Gestalt therapy is a humanistic approach that Barker (1999:194-195) defines as being a form of psychotherapeutic intervention, which seeks to assist individuals integrate their thoughts, emotions and behaviours. Emphasis is placed on becoming aware of and taking responsibility for one's own actions, expressing emotions and perceptions, and on recognizing the existence of gaps and distortions in one's own thinking.

Gestalt Theory has been included for the purpose of this study to highlight an infant's interaction with his/her environment, as well as contact with others.

1.6.5 NEURODEVELOPMENTAL PROFILE

A neurodevelopmental profile refers to specific ability domains or strengths and weaknesses we all carry round with us (Rourke, 1995). Such profiles identify predictors of poor outcome for various abilities and are not fixed they can change over time or through the implementation of effective intervention programmes (Rourke, 1995; Fine & Kotkin, 2003).

For the purpose of this study the neurodevelopmental profile will refer to the performance of infants diagnosed with FAS, Partial FAS and/or Non-FAS over the following developmental domains; Locomotor, Personal-Social, Speech and Hearing, Eye-Hand Coordination and Performance. Infants neurodevelopmental profiles will be assessed over two developmental stages; 7-12 month and 17-29 months of age.

1.7 LAYOUT OF RESEARCH REPORT

This research comprises of the following chapters:

CHAPTER ONE – Introduction and Overview

In this chapter the research problem, motivation for the study, the goal and objectives of the research, and research methodology are discussed.

CHAPTER TWO - The Medical and Psychosocial Implications of Fetal Alcohol Spectrum Disorder (FASD)

Chapter 2 begins with a brief historical overview of Fetal Alcohol Syndrome and Fetal Alcohol Spectrum Disorder. The literature then focuses on the characteristics of Fetal Alcohol Spectrum, the diagnosis and clinical evaluation, the cognitive and behavioural aspects associated with Fetal Alcohol Syndrome. Due to the importance of sensory integration in Gestalt Therapy and overall awareness, the brain regions associated with the senses, are discussed.

CHAPTER THREE – The Gestalt Perspective and Theories of Development

Key Gestalt concepts are discussed and integrated into the context of the study. The developmental tasks of infants in their early years are discussed with reference to developmental theories.

CHAPTER FOUR – Research Methodology: An Empirical Perspective and Integration of Findings

The research process used is discussed. Statistical analyses illustrate the findings of the research and are integrated into this chapter.

CHAPTER FIVE – An Integrated Summary of Conclusions, Limitations and Recommendations

General conclusions are discussed in this chapter with both the practical implications and limitations of the study as well as the offering of some recommendations for future research.

1.8 CONCLUSION

In this chapter the reader was provided with an introduction to the Fetal Alcohol Spectrum Disorder (FASD). Methodology of the research conducted was included, highlighting the intended hypotheses, goals and objectives as well as a description of the research design used. Emphasis was placed on the sample used, as well as a detailed explanation of the Griffiths Mental Development Scales (GMDS), the instrument used to measure the neurodevelopment of the study participants. An overview of the reports defining themes and layout were included to assist the reader in understanding the reports process of conveying relevant information. In the following chapter in-depth focus is placed on the medical and psychosocial implications of Fetal Alcohol Spectrum Disorder (FASD) in understanding important concepts from various disciplines referred to throughout the report.

CHAPTER 2

2 THE MEDICAL AND PSYCHOSOCIAL IMPLICATIONS OF FETAL ALCOHOL SPECTRUM DISORDER (FASD)

2.1 INTRODUCTION

Chapter Two forms part of an extensive literature review, highlighting the role of alcohol in pregnancy and the effect of alcohol on the fetus, directly affecting a child's ability of functioning within his/her social environment. The reader is guided through the historical background of Fetal Alcohol Syndrome, the process used when making a clinical diagnosis and potential damage to key neurological areas. It is impractical to focus on only the clinical aspects of Fetal Alcohol Syndrome, as each individual is accepted as parts of a larger whole, therefore a more holistic approach including physical, cognitive, psychological and emotional aspects of a child diagnosed with Fetal Alcohol Syndrome, are included.

Maternal alcohol exposure during fetal development may cause injurious alterations to the central nervous system of the unborn fetus. Fetal Alcohol Syndrome is a developmental disorder caused by prenatal exposure to high amounts of alcohol. The most common form of these alterations is a reduction in cognitive abilities.

2.2 HISTORICAL BACKGROUND

The harmful effects of alcohol on an unborn infant have been known to man for centuries. In the Old Testament, a prospective mother is visited by an angel who warns, "Behold thou shalt conceive and bear a son: now drink no wine or strong drink" (Judges 13: 3). Blume (1992: 3) cites that in 322 BC, Aristotle noted abnormal children being born to "drunken women". In ancient Greece drinking on one's wedding night was prohibited for both men and women, to prevent the conception of a damaged child and even Plato, the early father of theories, referenced abstinence at the time of conception (Spagnolo, 1993:89).

The "Gin Epidemic" in eighteenth century England created a controlled "natural experiment" and sparked a debate from many viewpoints (Golden, 2005:18). Cheap, manufactured gin was not subject to taxes, making it the drink of choice amongst the poor and working class, creating a spiral of complex health and social problems. Writers at the time noted that children born to gin-drinking mothers appeared "fragile, weak and withered" (Blume, 1992:2).

One of the first scientific studies on the effects of prenatal maternal alcohol consumption and its effects on children was published in 1899. In the study, Dr William Sullivan a Liverpool, England prison physician, compared the pregnancy outcomes of 120 alcoholic prisoners. Sullivan and colleagues (1899:489-503) reported that the rate of infant mortality was higher amongst alcoholic mothers. Later research by Lemoine, Harousseau, Borteyu, and Menuet (1968: 363-367) reported that infants born to alcoholic mothers presented with higher rates of birth defects.

Five years later, Jones and Smith (1973:999) coined the term "fetal alcohol syndrome" by identifying a set of distinct facial anomalies in infants whose mothers drank heavily during pregnancy. Their Washington University report was published in the Lancet, a major international journal of medicine, but these views were only reflected in standard textbooks six years later in 1979, due to uncertainty amongst doctors who had been recommending alcoholic beverages (in moderation) during pregnancy (Abel & Sokol, 1991:514-524).

In 1981 the Unites States Surgeon General reached an important milestone by advising pregnant women or women considering pregnancy, not to drink alcoholic beverages and to be aware of the alcoholic content in both foods and drugs. This increased awareness allowed for important changes in the advice given by medical practitioners about drinking and pregnancy (Golden, 2005:74- 75).

There have been dramatic research advancements in the field of alcohol related birth defects since Jones and Smith (1973:999) first introduced the early Fetal Alcohol Syndrome diagnosis. Since 1973 many articles have been published concerning the effects on reproduction. The need however, for a more standard frame of reference was evident.

The importance of a medical diagnosis is paramount in serving a number of purposes. In 1996, The Institute of Medicine (IOM) described the importance of a standardized medical diagnosis being a form of communication amongst both clinicians, as well as between the clinician and patient (Stratton *et al*., 1996:2-3). Streissguth (1997:222) emphasised a medical diagnosis as being the starting point for understanding, treating and managing any medical condition.

The following highlights the clinical features used when making a Fetal Alcohol Spectrum Disorder (FASD) clinical diagnosis.

2.3 THE MEDICAL DIAGNOSIS AND CLINICAL FEATURES

Prenatal alcohol use can result in Fetal Alcohol Syndrome (FAS), which presents as a combination of physical and behavioural symptoms. The diagnosis is based on several clinically derived phenotypical and neurodevelopmental features. Greenbaum and Koren (2002:1) define the primary, clinical features of Fetal Alcohol Syndrome (FAS) as the following:

A: Evidence of excessive maternal drinking during pregnancy

B: The characteristic facial dysmorphology (i.e. microcephaly, poorly developed philtrum, thin upper lip and flattened maxillary area) as seen in Figure 2-1

C: Pre-and/or post-natal growth retardation (weight, length and/or height below the 10th percentile)

D and **E**: Central nervous system damage (signs of neurological abnormality, developmental delay, intellectual impairment or neurobehavioral anomalies.)

Note 'A,B,C,D,E' refer to categories of clinical diagnoses referred to in Tables 2.1 to 2.6.

In 1978, Clarren and Smith (1978:1063-1067) introduced the term "Fetal Alcohol Effects" (FAE) which refers to abnormalities related to maternal drinking during pregnancy but the clinical features present do not allow for a full diagnosis of fetal alcohol syndrome (Warren & Foudin, 2001:202-206). This term attempted to widen the fetal alcohol syndrome diagnosis category but was later disregarded due to its non-specificity.

The Institute of Medicine (IOM), a committee formed to study Fetal Alcohol Syndrome, created five categories defined under the term "Fetal Alcohol Spectrum Disorder" (FASD) (Stratton *et al.,* 1996:3). The term Fetal Alcohol Spectrum Disorder is not intended for use as a clinical diagnosis, but merely as an umbrella term, including all possible disorders associated with prenatal alcohol exposure. These possible effects range from complete Fetal Alcohol Syndrome to subtler neurodevelopmental and behavioural manifestations.

The following clarification of the spectrum clearly highlights the clinical conditions associated with prenatal alcohol exposure, as cited by Hoyme *et al* (2005:39) and serves to familiarise the reader with the Fetal Alcohol Spectrum Disorder (FASD) diagnoses.

2.3.1 FETAL ALCOHOL SPECTRUM DISORDER- CATEGORY ONE

2.3.1.1 Fetal Alcohol Syndrome (FAS)

A diagnosis of fetal alcohol syndrome (FAS) is made when an individual has all four of the following major components of fetal alcohol syndrome as highlighted in Table 2.1 described in Hoyme *et al* (2005:39).

Table 2.1 Categories of Clinical Diagnosis (FAS)

Fetal Alcohol Syndrome (FAS)	
Category	**Description**
A	**Confirmed maternal alcohol exposure**
B	Characteristic pattern of minor facial anomalies, **including short palpebral fissures, thin vermillion border and a smooth philtrum.**
C	Evidence of prenatal and/or postnatal growth retardation **with height or weight less than or equal to the 10th percentile**
D	**Neurodevelopmental abnormalities of the CNS,** such as a small head size at birth; structural brain abnormalities with age-appropriate neurological hard or soft signs (e.g. impaired fine motor skills, neurosensory hearing loss, poor hand-eye coordination).
E	**Not Required for this diagnosis** Complex pattern of behaviour / cognitive abnormalities

(Hoyme *et al.*, 2005:39-47)

Table 2.2 below details the clinical diagnostic criteria used when making a Fetal Alcohol Syndrome diagnosis without confirmed maternal alcohol exposure.

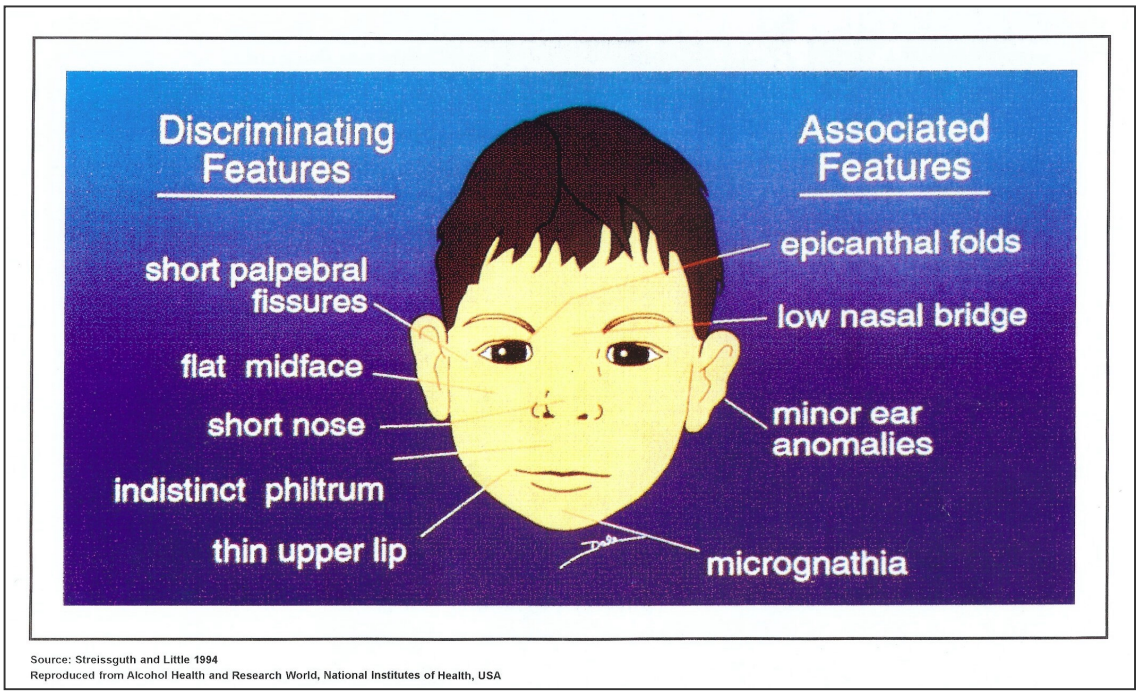
Table 2.2 Clinical Diagnosis (FAS), Unconfirmed Maternal Exposure

Fetal Alcohol Syndrome without Confirmed Maternal Alcohol Exposure	
Category	**Description**
A	**Not Required for this diagnosis** Confirmed maternal alcohol exposure
B	Characteristic pattern of minor facial anomalies, **including short palpebral fissures, thin vermillion border and a smooth philtrum.**
C	Evidence of prenatal and/or postnatal growth retardation **with height or weight less than or equal to the 10th percentile**
D	**Neurodevelopmental abnormalities of the CNS,** such as a small head size at birth; structural brain abnormalities with age-appropriate neurological hard or soft signs (e.g. impaired fine motor skills, neurosensory hearing loss, poor hand-eye coordination).
E	**Not Required for this diagnosis** Complex pattern of behaviour / cognitive abnormalities

(Hoyme *et al.*, 2005:39-47)

The characteristic pattern of minor facial features as mentioned in category C in the above tables are presented in Figure 2-1 below. The *short palpebral fissures, thin vermillion border* and *smooth philtrum* are important in making the Category One diagnosis of Fetal Alcohol Syndrome (FAS). It is necessary to note that many ethnic groups display similar facial characteristics, such as the *epicanthic folds*, *short nose* and a *long, smooth philtrum*. (Viljoen, 2005)

It is for this reason that a fetal alcohol syndrome diagnosis cannot be made on the mere presence of one of the above facial features, making it vital that a clinical diagnosis be made from within a holistic perspective (Stratton *et al.*, 1996:2-3).



(Streissguth & Little, 1994)

Figure 2-1 Facial Characteristics of Fetal Alcohol Spectrum Disorder (FASD)

Figure **2-2** below attempts to draw the reader's attention to the characteristic features present in a young child from the Northern Cape region of South Africa contributing to a fetal alcohol syndrome diagnosis; short palpebral fissures, thin vermillion border and smooth philtrum.

This child also falls below the 10th percentile for height and weight and has a small head. A maternal confirmation of drinking was also obtained (Stratton *et al.*1996).

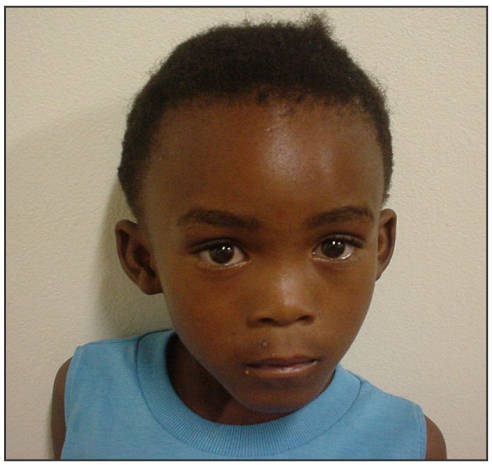


Figure 2-2 South African child with characteristic facial features of Fetal Alcohol Syndrome (FAS)

2.3.2 FETAL ALCOHOL SPECTRUM DISORDER - CATEGORY TWO

2.3.2.1 Partial Fetal Alcohol Syndrome (PFAS)

This diagnosis is assigned to individuals with confirmed alcohol exposure, and who present with some of the facial features of fetal alcohol syndrome and with any of the following: evidence of growth deficiency; CNS neurodevelopmental abnormalities, or a complex pattern of behavioural and cognitive abnormalities (Stratton *et al.*, 1996:3).

Hoyme *et al* (2005: 42) further adds that this category can be used as a "holding" group as a means to defer a diagnosis of Category One until further data collection or evaluation can allow for a more definite diagnosis.

Table 2.3 Clinical Diagnosis: Partial Fetal Alcohol Syndrome (PFAS)

Partial Fetal Alcohol Syndrome	
Category	**Description**
A	**Confirmed maternal alcohol exposure**
B	Characteristic pattern of minor facial anomalies, **including short palpebral fissures, thin vermillion border and a smooth philtrum.**
C	Evidence of prenatal and/or postnatal growth retardation **with height or weight less than or equal to the 10th percentile**
D	**Neurodevelopmental abnormalities of the CNS,** such as a small head size at birth; structural brain abnormalities with age-appropriate neurological hard or soft signs (e.g. impaired fine motor skills, neurosensory hearing loss, poor hand-eye coordination).
E	**Complex pattern of behaviour / cognitive abnormalities** inconsistent with developmental level & that cannot be explained by genetic predisposition, family background or environment alone. May include a marked impairment in the performance of complex tasks (complex problem-solving, planning, judgement, abstraction, metacognition and arithmetic tasks), higher level receptive and expressive language deficits, and disordered behaviour like difficulties in personal manner, motor dysfunction, poor academic performance, deficient social interaction

(Hoyme *et al.*, 2005:39-47)

Table2.4 below represents the partial fetal alcohol syndrome diagnosis *without* a confirmed maternal alcohol exposure.

Table 2.4 Clinical Diagnosis: Partial Fetal Alcohol Syndrome (PFAS) without Confirmed Maternal Alcohol Exposure

Partial Fetal Alcohol Syndrome without Confirmed Maternal Alcohol Exposure	
Category	**Description**
A	**Not Required for this diagnosis** Confirmed maternal alcohol exposure
B	Characteristic pattern of minor facial anomalies, **including short palpebral fissures, thin vermillion border and a smooth philtrum.**
C	Evidence of prenatal and/or postnatal growth retardation **with height or weight less than or equal to the 10th percentile**
D	**Neurodevelopmental abnormalities of the CNS,** such as a small head size at birth; structural brain abnormalities with age-appropriate neurological hard or soft signs (e.g. impaired fine motor skills, neurosensory hearing loss, poor hand-eye coordination).
E	**Complex pattern of behaviour / cognitive abnormalities** inconsistent with developmental level & that cannot be explained by genetic predisposition, family background or environment alone. May include a marked impairment in the performance of complex tasks (complex problem-solving, planning, judgement, abstraction, metacognition and arithmetic tasks), higher level receptive and expressive language deficits, and disordered behaviour like difficulties in personal manner, motor dysfunction, poor academic performance, deficient social interaction

(Hoyme *et al.*, 2005:39-47)

2.3.3 FETAL ALCOHOL SPECTRUM DISORDER- CATEGORY THREE

2.3.3.1 Alcohol Related Birth Defects (ARBD)

This category applies to those individuals with a confirmed heavy prenatal alcohol exposure and one or more congenital abnormalities, usually cardiac, skeletal, renal, ocular or auditory (Jacobson & Jacobson, 2002:282-286) clarified as follows in Table 2.5.

Table 2.5 Clinical Diagnosis: Alcohol Related Birth Defects

Alcohol Related Birth Defects (ARBD)	
Category	**Description**
A	**Confirmed maternal alcohol exposure**
B	**One or more congenital defects,** including malformations and dysplasias of the heart, bone, kidney, vision or hearing systems.
C	**Not Required for this diagnosis** Evidence of prenatal and/or postnatal growth retardation
D	**Not Required for this diagnosis** Neurodevelopmental abnormalities of the CNS
E	**Not Required for this diagnosis** Complex pattern of behaviour / cognitive abnormalities

(Hoyme *et al.*, 2005:39-47)

2.3.4 FETAL ALCOHOL SPECTRUM DISORDER- CATEGORY FOUR

2.3.4.1 Alcohol Related Neurodevelopmental Disorder (ARND)

This category is applied to individuals with a confirmed heavy alcohol prenatal exposure that displays measurable, albeit subtle neurodevelopmental deficits compared with fetal alcohol syndrome. Although reduced IQ scores are not always found (Goldschmidt, Richardson, Stoffer, Geva and Day, 1996:763-770; Jacobson, 1998:315) ARND individuals display developmental deficits in domains most severely affected in fetal alcohol syndrome. Stratton and colleagues (1996:3) clarify ARND as follows in Table 2.6.

Table 2.6 Clinical Diagnosis: Alcohol Related Neurodevelopmental Disorder (ARND)

Alcohol Related Neurodevelopmental Disorder (ARND)	
Category	**Description**
A	Confirmed maternal alcohol exposure
B	**Not Required for this diagnosis** Characteristic pattern of minor facial anomalies
C	**Not Required for this diagnosis** Evidence of prenatal and/or postnatal growth retardation
D	**Neurodevelopmental abnormalities of the CNS,** such as a small head size at birth; structural brain abnormalities with age-appropriate neurological hard or soft signs (e.g. impaired fine motor skills, neurosensory hearing loss, poor hand-eye coordination).
E	**Complex pattern of behaviour / cognitive abnormalities** inconsistent with developmental level & that cannot be explained by genetic predisposition, family background or environment alone. May include a marked impairment in the performance of complex tasks (complex problem-solving, planning, judgement, abstraction, metacognition and arithmetic tasks), higher level receptive and expressive language deficits, and disordered behaviour like difficulties in personal manner, motor dysfunction, poor academic performance, deficient social interaction

(Hoyme *et al.*, 2005:39-47)

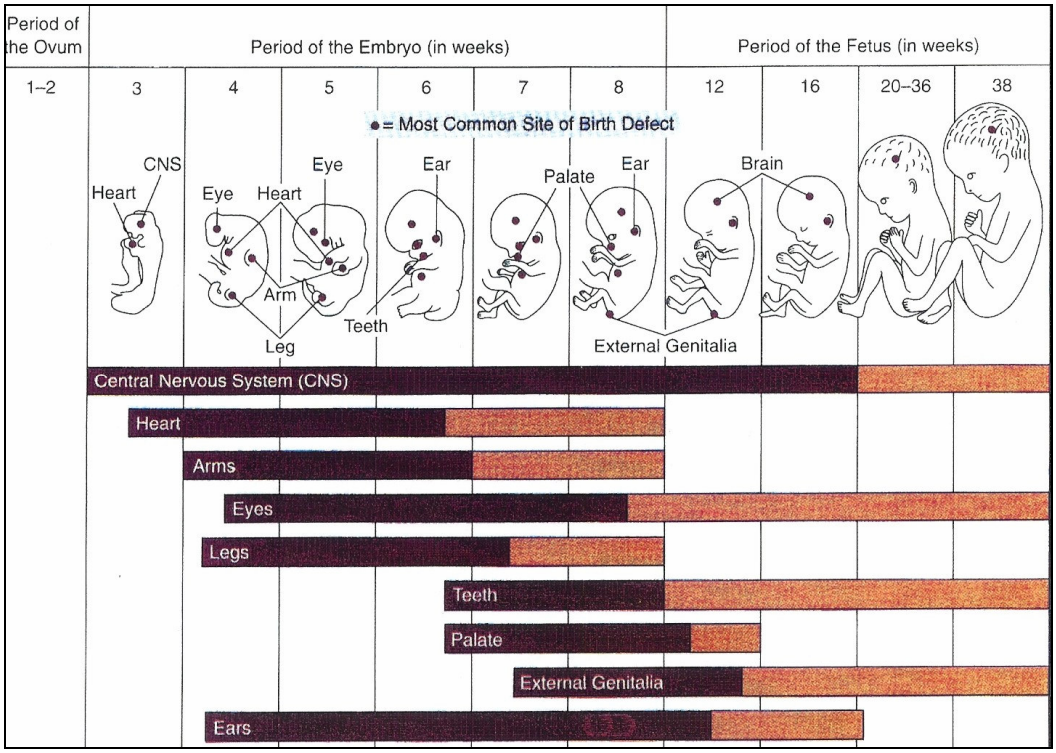
The term, Fetal Alcohol Effects (FAE) has now been replaced by alcohol-related birth defects (ARBD) and alcohol-related neurodevelopmental disorder (ARND) to accommodate a category within the fetal alcohol spectrum (Hoyme *et al*., 1995).

A common misunderstanding exists, that fetal alcohol syndrome is on the extreme negative end of the scale, with alcohol related neurodevelopmental disorder representing less negative effects. This however may not always be the case; Greenbaum, Nulman, Rovet and Koren (2002:215) describe a longitudinal analysis, which suggests that alcohol related neurodevelopmental disorder is a significant disorder in its own right. A number of other studies conducted by researchers including, Mattson and Riley (1998:279) confirm that the effects of prenatal alcohol exposure can be as damaging for children with an alcohol related neurodevelopmental disorder diagnosis as for children with fetal alcohol syndrome, as in both cases the central nervous system has been permanently affected.

The following seeks to draw the reader's attention to damage of the central nervous system, due to prenatal alcohol exposure- implicating the following neurological, cognitive and behavioural components of the developing infant.

2.4 THE CENTRAL NERVOUS SYSTEM

Alcohol disrupts the normal growth and passage of neural cells, leading to defects within the brain. The central nervous system (CNS) consisting of the brain and spinal cord is most affected. This system connects to sensory organs, other organs of the body, muscles, blood vessels and glands, resulting in secondary dysfunction to the visual, auditory and olfactory systems (Waugh & Grant, 2001:145-150). As can be seen below in Figure 2-3 the central nervous system develops throughout pregnancy, with the brain continuing its development well into early childhood. The spine and brain are amongst the most vulnerable organs to the effects of prenatal alcohol exposure.



(Adapted from Moore & Persaud, 1993:156)

Figure 2-3 Vulnerability of the Fetus to defects during different Periods of Development

The unborn baby is vulnerable to birth defects at various times of fetal development. To give the reader a comprehensive understanding of the development of a fetus, Figure 2-3 will briefly be discussed.

In weeks **1** and **2**, pre-implantation occurs, which if combined with toxic exposures may cause prenatal death, at which point the pregnancy may not continue. At this point in the pregnancy developmental deficits will not affect the ovum (Modell & Modell, 1992).

In week **3**, fertilization of the ovum forms a zygote, which comprises embryonic stem cells. As shown in Figure 2-3, both the heart and central nervous system are already in the process of forming. Women are often unaware of their pregnancy at this early point, increasing risks of fetal alcohol syndrome if alcohol is being consumed (Modell & Modell, 1992 & Moore & Persaud, 1993).

Weeks **4** and **5** sees the development of the eyes, ears, arms and legs. The central nervous system and the heart continue to develop (Moore & Persaud, 1993).

The most common phase of birth defects occurs around weeks **6, 7** and **8** with the development of the ear, teeth, palate and external genitalia. At this point the brain divides into the 5 vesicles, with the heart and CNS all the while developing (Moore & Persaud, 1993).

From weeks **12** to week **38** the brain increases in size, with the head comprising nearly half of the fetal size. The face is well formed and starts taking on a human appearance. Genitals appear well differentiated and the fetus can make a fist with its fingers. Muscle tissue and bones are developed with bones becoming harder. Sucking motions are made with the mouth (Modell & Modell, 1992; Moore & Persaud, 1993).

The red portion of the bars present in Figure 2-3 represents the most sensitive periods of development, during which teratogenic effects on the periods listed would result in major structural abnormalities in the child. The yellow portion of the bars represents periods of development during which physiological defects and minor structural abnormalities would occur (Moore & Persaud 1993).

The dose, timing and conditions of exposure, as well as individual characteristics of both the mother and fetus combine in determining the factors that may hinder normal fetal development. The relationship between alcohol exposure and fetal growth varies depending on the timing and pattern of maternal alcohol use (Jacobson, 1997:199-200).

After discussing Figure 2-3 it is important the reader note that even seemingly low levels of alcohol can still damage the brain even without the presence of obvious physical anomalies.

Studies in the eighties showed that alcohol use during pregnancy caused microcephaly, a small head circumference relative to an infants' body size and weight (Ernhardt, Wolf & Linn 1985:447-453; Rosset, Weiner, Lee, Zuckerman, Dooling & Oppenheimer, 1983:539-546). The small head directly refers to the size of the brain. Observing alcohol and the developing brain, Chen, Maier, Parnell and West (2003:175) cite research where children whose mothers stopped drinking before the end of the second trimester had larger head circumferences than those children whose mothers continued to drink throughout their pregnancy. It is apparent that the infant's head circumference constitutes a simple, inexpensive and quick tool to assess the development of the CNS and identify infants at risk for future neurodevelopmental disorders (Garcia-Alex, Saenz-de Pipaon, Martinez, Salas-Hernandez & Quero, 2004:548-584).

Neurobehavioral dysfunction is related to the cognitive and behavioural impairments, caused by the structural and functional changes within the brain. Researchers have studied both animal and human brain structures in an attempt to understand the brain dysfunction that occurs in patients diagnosed with fetal alcohol syndrome disorder (Goodlet & Horn, 2001:175-184).
Techniques for studying the brain, such as magnetic resonance imaging (MRI) reveal a reduced brain volume of several brain regions in individuals with fetal alcohol syndrome as well as inconsistent reductions in the size of specific brain structures (NIAAA, 2000:2).

2.5 THE STRUCTURE OF THE BRAIN

The following figure illustrates the various parts of the brain, discussed below, which may be damaged due to maternal alcohol consumption during pregnancy.

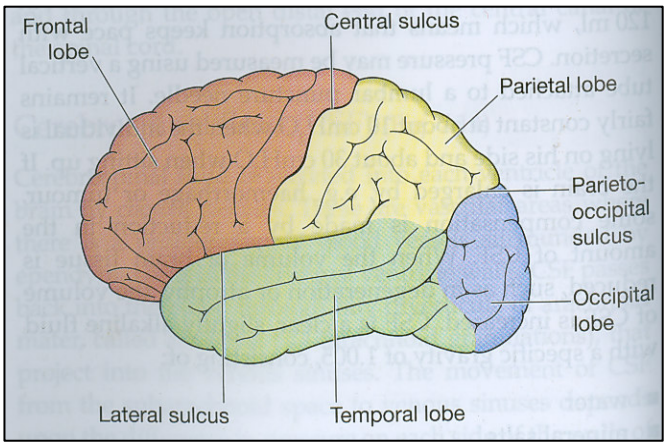


Figure 2-4: Diagram of the brain

One such affected area is in the deep-brain structure called the **basal ganglia**. The basal ganglia are a group of nerve cell clusters involved in motor abilities and cognitive functions. Damage to the basal ganglia in humans impairs skills such as the ability to shift one's attention from one task to another, inhibition of inappropriate behaviour and spatial memory. **Corpus Callosum** abnormalities have been linked to deficits in attention, intellectual functioning, reading, learning, verbal memory and executive and psychosocial functioning. The Corpus Callosum is a large nerve bundle of fibres connecting the right and left hemispheres of the brain (Waugh & Grant, 2001). Studies have shown that approximately 7% of children with fetal alcohol syndrome lack the presence of a corpus callosum (NIAAA, 2000: 2).

Another brain structure affected is the cerebellum located at the base of the brain, which, in fetal alcohol syndrome children is reduced in size. The **Cerebellum** is involved in both motor and cognitive skills, affecting balance and coordination if injured. The hippocampus is a structure that lies deep within the temporal lobe of the brain and damage to this region inhibits various domains of memory (Mattson *et al*., 2001:189).

The **Limbic System** can be found at the base of the forebrain, just above the thalamus and hypothalamus. Barlow and Durand (1999:38) describe this system as including structures such as the hippocampus, mentioned above, the cingulate gyrus, septum and amygdala. This system only exists in mammals and regulates emotional experiences and expressions. It is also plays a part in basic drives such as sex, aggression, hunger and thirst, regulating body temperature, blood pressure and blood sugar level (Bluestone, 2004:143-144).

This part of the brain consisting of regulatory states is commonly affected when alcohol is consumed during gestation. The researcher is of the opinion that it is important to consider the role of the limbic system in stress and emotional responses, as this region usually assists an individual to detect danger or closes off threatening stimuli. The above-described areas are some aspects affected in children with fetal alcohol syndrome.

Senses and their impact on the awareness of self, environment and contact making are essential in the development of an individual. The following section seeks to integrate aspects of the brain structures and senses.

2.5.1 THE INTEGRATION OF BRAIN STRUCTURES AND SENSES

From a Gestalt perspective, sensory and bodily awareness contributes to the overall functioning of an infant and child. Thompson and Rudolph (1996:150) state that the senses encompass the thoughts, emotions and the body, making an individual more aware of the emotions experienced at a specific moment. As cited in Blom (2004:98), Schoeman emphasises that it is through sensory contact with the external environment that individuals are required to make choices in their life acceptable to the larger community. This may explain the different perception individuals with fetal alcohol syndrome have of their environment. Further concepts of Gestalt theory and the overall development of infants' will be discussed in Chapter Three, with reference to their impact on an infant diagnosed with Fetal Alcohol Syndrome.

As discussed above, various parts of the brain may well be affected through prenatal alcohol exposure; it is at this point that the reader's attention be drawn to the brain structures impacting on sensory functioning.

The main areas of the cerebrum associated with sensory perception and voluntary motor activity are known, however it is unlikely that any of these areas are associated exclusively with one function. This medical understanding can be compared to the therapeutic experience of Oaklander (1988:120) who suggests that many sensory experiences involve a combination of senses, making it difficult to provide a single sensory experience.

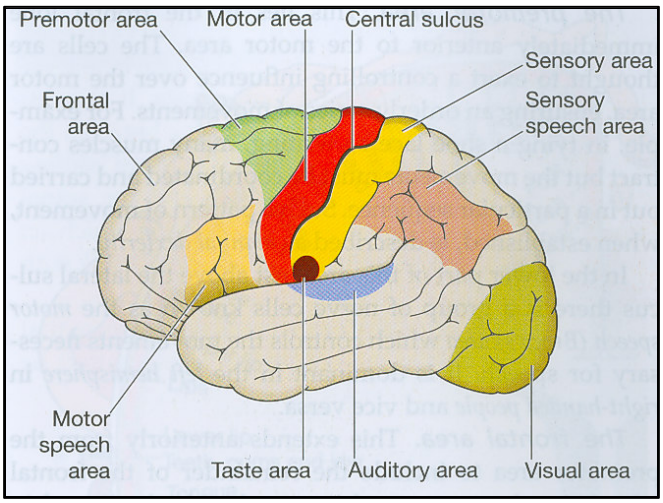


Figure 2-5 The Cerebrum showing functional areas

Figure 2-5 illustrates the motor and sensory areas of the cerebrum. For the purpose of integrating the sensory brain structures, focus will be placed on the following sensory areas (Waugh & Grant, 2001:152).

2.5.1.1 Parietal Area

The functions associated with the parietal area are linked to **obtaining and retaining** accurate knowledge of objects. Waugh & Grant (2001:152) add that objects can be recognised by touch alone due to knowledge from past experience (memory) retained in this area.

2.5.1.2 Visual Area

Vision is the main coordinating sense used to help an individual understand the world around them. The visual area lies behind the parieto-occipital sulcus and includes the greater part of the occipital lobe. The optic nerves pass from the eye to this area, which receives and interprets the impulses as visual impressions (Waugh & Grant, 2001:152).

2.5.1.3 Auditory Area

The **auditory** area is one of the first to develop, with the infant being able to hear before he is born. The brain area associated with this sense lies below the lateral sulcas within the temporal lobe. The cells receive and interpret impulses transmitted from the inner ear by the cochlear (Waugh & Grant, 2001:152).

2.5.1.4 Olfactory Area

The **olfactory** area lies deep within the temporal lobe where impulses from the nose are received and interpreted via the olfactory nerves (Waugh & Grant, 2001:152). The sense of smell is used to gather information about the surroundings. Smell connects vividly to memories from the past.

2.5.1.5 Speech Area

The **sensory speech** area is situated in the lower part of the parietal lobe and extends into the temporal lobe. The tongue is an important organ for both speech and taste areas. It is the instrument for the verbalisation of emotions and feelings and it is in the speech area that the spoken word is perceived (Schoeman & Van Der Merwe, 1996:48; Waugh & Grant, 2001:152).

2.5.1.6 Taste Area

The **taste** area is thought to lie just above the lateral sulcus in the deep layers of the sensory area. Schoeman (1996:47) adds that taste is a sensory observation linked to several other impulses. In this area, impulses from special nerve endings in the taste buds in the tongue and in the lining of the cheeks, palate and pharynx are perceived as taste (Waugh & Grant, 2001:152), by combining temperature, texture and smell.

The development and role of the senses will be discussed Chapter Three, which will seek to integrate Gestalt concepts, development of the infant and the importance of the senses in strengthening the self.

Kodituwakku, and colleagues (2001:193-194) cite research demonstrating that prenatal alcohol exposure can lead to damage in various regions of the brain disturbing the overall functioning of an individual. These impairments contribute towards cognitive and behavioural difficulties, clarified below.

2.6 THE COGNITIVE AND BEHAVIOURIAL IMPAIRMENTS ASSOCIATED WITH PRENATAL ALCOHOL EXPOSURE

Fetal Alcohol Syndrome is the leading cause of mental retardation and the only one that is truly preventable (Amlung & Kenner, 2005:1-2). There is increasing evidence that alcohol-exposed children are deficient in their attention and executive functioning (Coles, Platzman, Raskind-Hood, Brown, Falek, & Smith, 1997:150-161; Kodituwakku, Handmaker, Cutler, Weathersby & Handmaker, 1995:1558-1564), as well as having impairments in information processing, visual-spatial reasoning, visual memory, and motor functions.

Memory, motor coordination, complex problem solving and abstract thinking are further domains that are affected by prenatal alcohol consumption (Connor, Sampson, Bookstein, Barr & Streissguth, 2000:331-354). It is apparent from previous research, that both mental and motor development is implicated in children diagnosed with fetal alcohol syndrome (Golden, Sokol, Kuhnert & Bottoms, 1982: 933). Jacobson and Jacobson (2002:282-286) state that children with Fetal Alcohol Syndrome tend to have difficulties with complex language tests especially those addressing practical aspects of language.

It is anticipated that the damage done to the brain and cognitive functions have a direct consequence on the intelligence of the child. Numerous researchers have demonstrated intellectual deficits in children with fetal alcohol syndrome from profound mental retardation to a level where individuals can function adequately in mainstream schools, with the average Intelligence Quotient (IQ) being in the borderline range (70-79) (Adnams, Kodituwakku, Hay, Molteno, Viljoen & May, 2001:557).

The majority of children with fetal alcohol spectrum disorder have significant academic difficulties, usually requiring special education services and / or vocational programs.

In Brown (1999:319-320) Streissguth describes secondary disabilities, as being those that a child is not born with, and that could presumably be avoided through a better understanding and appropriate interventions.

These disabilities manifest later in the child's development due to the already affected cognitive, behavioural and physical anomalies (Roebuck, Mattson & Riley, 1999:1070). Children with any Fetal Alcohol Spectrum diagnosis are at a higher risk of secondary disabilities, particularly behavioural problems which interfere with their home, school and/or social environments (Streissguth, 1990:648-649, Adnams *et al*., 2001:558). Mattson *et al* (2001:187) described some of these secondary behaviours as being an increased risk of psychiatric disorders, trouble with the law, and alcohol and drug abuse. Persistent hyperactivity is commonly observed in children with fetal alcohol syndrome (Steinhausen, Williams & Spohr, 1993:990-994) with a tendency of them being disruptive, impulsive and delinquent (Roebuck *et al.*, 1999:1071).

2.7 FASD RECOGNITION IN INFANCY

The diagnosis of an infant, especially a newborn, with fetal alcohol spectrum disorder is complicated, as not all features may be clinically visible. Some authors suggest that fetal alcohol syndrome may not be recognised until postnatal growth retardation and developmental delay become apparent. This has, however, been disproved with researchers clinically identifying fetal alcohol syndrome (FAS) as well as Partial fetal alcohol syndrome (PFAS) in infancy (Jones & Smith, 1973:999; Stoler & Holmes, 2004:125).

Although there have been prominent developments in mapping neurobehavioral deficits in children with fetal alcohol syndrome, researchers have not yet been able to establish a neurocognitive profile that characterises this syndrome. Infant studies allow for the study of development delay, a precursor to further serious neurocognitive deficits according to Adnams *et al* (2001:561).

The normal development of the infant will be discussed in Chapter Three. However, infants with Fetal Alcohol Spectrum Disorder exhibit the following characteristics during their development (National Centre of Continuing Education, 2005).

- A decreased length and head circumference, with a weight below the 50th percentile.
- Difficulty in sleeping –unpredictable sleep/wake cycles
- Feeding difficulties
- Heart defects, kidney problems or skeletal abnormalities
- Easily over stimulated- Increased sensitivity to light and sound
- Neurological dysfunctions
- Poor fine motor control
- Poor gross motor control
- Seizures, tremors or jitteriness
- Susceptibility to infections

Researchers often describe failure to thrive in affected children, from both *Organic and Inorganic* origins. *Organic failure* to thrive has a definite logical cause, due to hyperirritability and feeble sucking ability. Inorganic failure to thrive is subsequent to psychosocial rather than physiological cause and is commonly due to dysfunctional home and family environments (Amlung & Kenner, 2005:1-2).

Infants found to be exposed to alcohol at any time during gestation were found to have significant alterations in their reflexive behaviour, less mature motor behaviour, and increased activity levels (Coles, Smith, Fernhoff & Falek, 1985:459). As cited in Kelly, Day and Streissguth (2000:148) research conducted by Coles, Smith and Falek (1987:87-104) suggested that prenatal alcohol exposure negatively affects infants' behaviour, suggesting that deficits in early attachment behaviour and primitive, limbic system regulations are largely the result of alcohol exposure rather than maternal behaviour.

The most recent rate of fetal alcohol syndrome in the United States has been estimated at 0.97 per 1000 (May *et al*., 2000:1905). It is estimated that as many as 10 000 to 12 000 affected babies may be born annually, thereby making fetal alcohol syndrome the single most serious frequent, and often, serious birth defect. A total of 80,000 babies with serious birth defects are born in South Africa each year (March of Dimes Global Report on Birth Defects, 2006). In the US, lifetime cost estimates of fetal alcohol syndrome-affected individuals range from $75 million to $9.7 billion (South Dakota Developmental Disabilities, 2002). Although fetal alcohol spectrum disorder-specific burdens of disease estimations have not yet been undertaken in South Africa, 15000 babies are estimated to be born with Fetal Alcohol Syndrome annually (March of Dimes Global Report on Birth Defects, 2006), which is likely costing South Africa several billions of rands.

Community beliefs and maternal risk factors all contribute to the development of an infant affected with Fetal Alcohol Syndrome.

2.8 MATERNAL RISK FACTORS

The search for unique maternal characteristics and risk factors has been important in determining the etiology of fetal alcohol syndrome and the prevention thereof. Not all women who drink during pregnancy give birth to a child with fetal alcohol spectrum disorder (May *et al*., 2005:1196). In epidemiological studies conducted in 2000 and 2005 of women who drank during pregnancy May and colleagues (2000:1905; 2005:1196) identified traits that are strongly associated with fetal alcohol spectrum disorder births. Maternal age, socio-economic status, ethnicity, genetic factors, nutrition and maternal alcohol metabolism are some of the risk factors which represent a variety of conditions that are often associated with the birth of a child with fetal alcohol syndrome and/ or other alcohol-related conditions (May *et al.*, 2004:10-20).

A number of studies related to risks associated with drinking patterns revealed that it is not the total amount of alcohol consumed, but rather, the number of drinks consumed at one occasion (Warren & Foudin, 2000:156) that increases a woman's risks.

A single drink of absolute alcohol (AA) is equivalent to 150ml of wine (a large wineglass), 340ml of malt beer (one can) or 30ml of spirits (one tot). Binge drinking is harmful for the fetus as it increases the blood alcohol concentrations (BACs), allowing for greater risk of

prenatal injury. Heavy drinking or binge drinking during pregnancy is defined as at least five standard drinks taken more than twice a month, or an average of at least two standard drinks per day (Ernhart, Sokol & Martier, 1987:33-39).

Viljoen, Croxford, Gossage, Kodituwakku and May (2002:11) concluded that heavy drinking (5+ standard drinks per day) is by far the most prevalent pattern of consumption in a community in the Western Cape, South Africa. Assessing drinking patterns is problematic and researchers have found that mothers tend to understate their actual levels of drinking during pregnancy due to stigma, low self-esteem and depression thus making the recall of exact amounts of ingested alcohol complex.

2.9 CONCLUSION

In this chapter the reader was provided with a medical overview of Fetal Alcohol Spectrum Disorder (FASD), encompassing both the clinical features present as well as the process by which a medical diagnosis is assigned. Clinical, neurological, cognitive and behavioural factors relating to fetal alcohol spectrum disorder are all implicated through maternal alcohol consumption during pregnancy and have all been described, allowing for the creation of a practical frame of reference, to be utilized throughout this research dissertation. Due to the increasingly high rates of fetal alcohol syndrome in South Africa, a need has emerged to prevent the disorder. The assigning of a fetal alcohol spectrum disorder diagnosis in infancy would allow for a more effective intervention approach towards assisting the child and the family.

The following Chapter will assist the reader in understanding important aspects within the development of the infant. Reference will be given to key Gestalt Theory concepts, as it is through this approach that an integration of both theory and research be developed.

CHAPTER THREE

3 THE GESTALT PERSPECTIVE AND THEORIES OF DEVELOPMENT

3.1 INTRODUCTION

As discussed in Chapter Two the intake of alcohol, in varying degrees, during pregnancy has adverse effects on both fetal growth and development. In this chapter, emphasis is placed on understanding the Gestalt perspective, with key Gestalt concepts defined and then integrated into Chapter Five. Before developmental delay in infants with fetal alcohol syndrome (FAS) can be described a general understanding of normal development is essential. The development of the infant will be examined in this chapter focusing on psychomotor, emotional and cognitive development, with reference to various theories of development.

3.2 GESTALT PERSPECTIVE

The Gestalt-approach draws from a number of influences, including that of psychoanalysis, phenomenology, existentialism and eastern philosophy. Gestalt therapy focuses on the processes of human contact (Strümpfel & Goldman, 2002) encompassing the cognitive and emotional totality of each person, each moment and each event (Blom, 2004:2). In 1994, Oaklander described Gestalt as a humanistic, process-orientated form of therapy, concerned with the health and functioning of all aspects of a person- senses, body, emotions, and intellect (Oaklander, 1994:143).

The word *"gestalt"* roughly refers to the notion of wholeness or completeness of an idea, which forms the basis of Gestalt therapy. It is of the researcher's opinion that Gestalt therapy aims to help individuals improve their perceptions and experiences in totality implying that human beings are in themselves self-regulating and growth-orientated, and that individuals and their symptomatic behaviour cannot be understood in isolation of the environment (Yontef & Jacobs, 2000:304). According to Perls, people are an entity, both within themselves and in their environment (Perls, Hefferline & Goodman, 1977). This emphasises the inseparable entity of the body, emotions, spiritual aspects, language, thought and behaviour.

Perls also considers the activities of the left and right hemispheres of the brain as being important. These concepts are essential when working with infants whose central nervous systems have been damaged due to prenatal alcohol exposure. Gestalt therapy includes techniques and approaches that integrate both the left and right hemispheres of the brain

(Clarkson & Mackewn, 1994:36) and therefore are important to consider in the intervention programmes developed for infants diagnosed with fetal alcohol spectrum disorder.

3.2.1 GESTALT THERAPY

Gestalt therapy is built on holistic and phenomenological structures that pull together to allow for total awareness of one's self and environment rather than of the content.
As quoted by the founder of Gestalt therapy, Frederick Perls (1973:9)
"we do not have a body, we are a body…we are *somebody*."

The main aim of Gestalt therapy is to facilitate an individual's level of awareness through their sensory, motor and intellectual modalities. It is the holistic process of contact with, or withdrawal from others in the field, as well as of self- regulation and meaning making, which takes place within the person as a whole and creates the opportunity for change (Yontef, 1993:200).

Yontef (1993:200) discusses the following three principles as being the cornerstones of the Gestalt theory:

a) Gestalt therapy is phenomenological, with its only goal being an increased **awareness.**
b) Gestalt therapy is based on **dialogic** existentialism.
c) Lastly, that Gestalt therapy's foundation is based on a **holism.**

For the purpose of this research, focus will be placed on the following concepts; awareness, contact and self-regulation. These will briefly be described below in terms of the Gestalt theory and then integrated into the development of an infant with Fetal Alcohol Syndrome.

3.2.1.1 Awareness

Awareness is the core concept in understanding Gestalt Therapy. In attempting to support the individual's innate drive towards life and growth, an awareness of both the interior and exterior environment is essential. Awareness is a form of experiencing or sensing, of being in full contact with an individual/ environment at a sensorimotor, emotional, cognitive and energetic level (Yontef, 1993:202). This is achieved through the integration of ones physical sensations, feelings and imagination as well as the understanding of what is happening within the environment in which the individual is integrated.

Sinay (1998:89) defines awareness as, "…a deliberate consciousness about what is happening (physical, sensations, feelings, imagination) 'to me' and what is happening in the environment I am integrated in".

Polster and Polster (in Passons, 1975:20) describe awareness as being a process and compare it to an "underground spring, a refreshing experience ready for use when needed".

As a workable definition, the researcher states that awareness is a process reached through the conscious experiencing of ones feelings, senses and thoughts and the ability to regulate behaviour within a specific environment in the here and now. When there is an integration of the external stimuli (environment/ individual) and the self, a *total awareness* is attained.

3.2.1.2 Contact

Contact is the basic process of relationships. Yontef (1993:203) refers to it as an acknowledgment of the Self and others with an appreciation of the differences that exist between the two. Contact- making includes four aspects: connecting, separating, moving, and awareness.

The aim of making contact is to use the environment for the satisfying of needs (Blom, 2004:19). Yontef (1993:203) clarifies the contact-making process as follows: the child exists within a field, a process of systematic relationships differentiated by boundaries. It is at this contact boundary that the process of separating or connecting occurs. Blom (2004:19) adds that it is here where the child distinguishes between that which is part of him and that which foreign or from the environment. Effective boundaries are permeable allowing transactions between the individual and the environment. When boundaries become ineffective, disturbances arise. Yontef and Simkin (1989:332-333) identify the following contact boundary disturbances, which will briefly be discussed:

- **INTROJECTION** - occurs when children take in content from their environment without considering the positive or negative aspects. Children sacrifice their own opinions and beliefs and accept the views/ feelings of others. This affects the process of self-regulation and the awareness of self (Blom, 2004:22-23)

- **PROJECTION**- implies that children do not hold themselves responsible for their own emotions or behaviour but rather blame the environment for the unpleasant experiences in their lives (Yontef & Simkin, 1989:332)

- **CONFLUENCE** – occurs when there are a lack of boundaries between children and their environment. Children do not know where they themselves begin and where the environment ends. Often these children develop a poor sense of self, making positive contact with others difficult (Blom, 2004:25)

- **DEFLECTION** – refers to avoiding direct contact with others, thereby reducing the awareness with the environment. Often deflection is used as a coping mechanism, allowing children to protect themselves against unpleasant situations (Oaklander, 1994:144-145)

- **RETROFLECTION** - retroflection refers to a situation where a child does to himself what he wants to do to others (Perls, Hefferline and Goodman, 1977:183). Often this type of self-infliction causes great distress to the self, manifesting as psychosomatic symptoms in the child (Oaklander, 1994:144). Anger is often retroflected, due to being seen as unacceptable to project ones own anger onto others.

3.2.1.3 Self-Regulation

According to Gestalt Therapy, all behaviour is regulated by a process, called homeostasis or organismic regulation. Yontef (1993:210) describes organismic self- regulation as being the ability to sense the external reality (environment) and its needs as well as the internal needs, feelings and beliefs, then holistically understanding what is suitable for that person. Blom (2004:11) further details homeostasis as being the process during which an organism achieves a balance between sensory, mental and emotional facets. Through this balance, awareness of a need emerges. Pressure mounts within the organism to assure that the physical, emotional, social, spiritual or intellectual need is met. The organism may experience a sense of internal discomfort until the specific need is satisfied.

Self-regulation is a natural process, requiring a biological energy directed by awareness. It functions through the process of contact and withdrawal from the boundary. According to

Zinker, (in Grobler, 2003:101) the contact- awareness cycle is based on withdrawal, sensation, awareness, and the mobilization of energy, action contact and withdrawal.

In an attempt to summarise the theoretical gestalt concepts, the researcher is of the opinion that the following takes place; through an increased awareness at all levels, the individual seeks to satisfy a dominant need. To achieve this need the person attempts to make contact with the environment either by assimilating or rejecting information being passed through the contact boundary. The information received allows for an internal- balance, regulating the "self" into making decisions or demonstrating certain behaviours.

It is necessary for the reader to note that although the gestalt perspective has been integrated into this research at a theoretical level, no gestalt therapy has been conducted on the infants due to the quantitative nature of the research. Future recommendations in Chapter Five will, however, include concepts associated with Gestalt Play Therapy.

3.2.2 GESTALT PERSPECTIVE WITH REFERENCE TO THE CHILD WITH FETAL ALCOHOL SYNDROME

In seeking to understand the gestalt concepts defined above, with reference to the child with FAS, attention needs to be placed on how the child behaves or interacts with his environment.

Various studies conducted on the behaviours associated with prenatal maternal alcohol consumption in children, have enabled the development of a behavioural profile specifically for these children. The following seeks to highlight the main findings, identifying that children with Fetal Alcohol Syndrome demonstrate disturbances in awareness, contact and self-regulation.

The researcher is of the opinion that children with Fetal Alcohol Syndrome (FAS) do not experience their environment in its entirety in the integration of their physical sensations, feelings and imagination perceiving themselves and their world differently.

This lack of **awareness** influences their self-awareness and their feelings towards self, individuals and the environment. This distortion in awareness may be due to brain abnormalities associated with prenatal alcohol consumption. Research has proven that children with Fetal Alcohol Syndrome tend to be egocentric and do not comprehend how their actions

or behaviours relate to the feelings of others. They often give into peer pressure being highly influenced and are not always able to distinguish between reality and fantasy. They act impulsively and often have difficulty associating actions with the consequences of their actions, missing social cues sent out by the environment (Streissguth, Barr, Sampson, Parrish-Johnson, Kirchner & Martin, 1986:717-725; Jacobson, Jacobson & Spool, 1994:1125-1132; Coles *et al*., 1997:159-161, Mattson & Riley, 1998:279-294; Thomas, Kelly, Mattson & Riley, 1998:528-533; Mattson *et al*., 2001:186-187).

It is difficult for children with Fetal Alcohol Syndrome (FAS) to form a balance between themselves and the environment, thereby not making effective **contact**. Previous researchers have proven that children diagnosed with Fetal Alcohol Syndrome (FAS) may steal and lie to follow their own desires thus satisfying their immediate need. They are stubborn and oppositional in their approach to behaviour, exhibiting signs of contact boundary disturbances such as introjection, projection and deflection, as discussed above in Section 3.2.1.2. They are typically distracted and often diagnosed with Attention Deficit Disorder (ADD) or Attention-Deficit- Hyper-Activity disorder (ADHD). Due to this inability of making contact, they often lack reciprocal friendships, are socially withdrawn and sullen, often resorting to teasing and bullying behaviour to make contact with others (Streissguth *et al*., 1986:717-725; Jacobson *et al*., 1994:1125-1132; Coles *et al.*, 1997:159-161; Mattson & Riley, 1998:279-294; Thomas *et al*., 1998:528-533; Mattson *et al*., 2001:186-187).

Another Gestalt concept the researcher feels affects children with Fetal Alcohol Syndrome (FAS), is self-regulation as they unable to balance their own needs, feelings or perceptions with the environment around them.

The constant inability to either assimilate or reject information from the environment often causes fits of temper and defiant behaviour towards either their parents or school. They do not conform to social etiquette, as they do not understand or accept social rules. They often exhibit low self-esteem, depression and thoughts of suicide due to the imbalance or non-homeostatic relationship between themselves and the environment (Streissguth *et al*., 1986:717-725; Jacobson *et al.*, 1994:1125-1132; Coles *et al*., 1997:159-161; Mattson & Riley, 1998:279-294; Thomas *et al*., 1998:528-533; Mattson *et al*., 2001:186-187).

Due to the extensive research conducted on children with Fetal Alcohol Syndrome the researcher notes that inference can be made that if infants with Fetal Alcohol Spectrum

Disorder are not placed into an early intervention programme, similar behavioural disruptions may manifest.

3.3 THEORIES OF DEVELOPMENT

In order to understand the developmental delays associated with FAS, it is necessary to highlight the developmental process in healthy infants.

Development can be described as being a progressive series of orderly changes, which are either structural or behavioural in nature, referring to skills and abilities (Molteno, 1991:32; Nelson & Israel, 2000:20). Psychomotor development focuses on emerging motor, cognitive and social skills in infants. Development is unique to each individual child, yet predictable in it's pattern as well as dependant on an interaction between biological and environmental factors (Salkin 1985:2; Wait, Meyer & Loxton, 2003:1). Agarwal and colleagues (1992:467-480) state that the early years of any child's life are crucial for psychomotor, cognitive and emotional development with the most critical period for the development of delays being between 10-12 months, when the home environment influences physical growth and mental development. It is due to this that the first neurodevelopmental assessment was administered on infants between the ages of 9-17 months of age.

For descriptive purposes, psychomotor development can be divided into two modalities: locomotion and manipulation.

3.3.1 PSYCHOMOTOR DEVELOPMENT

3.3.1.1 Locomotion

Human infants take approximately 12 months to achieve what baby animals can do on the first day of life namely, standing and walking. During these 12 months the infant's gross motor coordination develops gradually yet thoroughly. Development starts with the infant being able to extend all his joints. Through this usage of limbs and joints the infant's muscle tone increases, with the primitive reflexes disappearing. The mass movement of all the limbs gives rise to the voluntary movement of one limb at a time, increasing the strength of both the arms and legs (Coovadia & Wittenberg, 1998:26)

The development of the posture and balance mechanisms allows for motor independence with the infant gaining control over the head, neck, trunk, chest and then legs. A 10 month infant

pulls up to stand, and then slowly begins walking. By 15 months of age, the infant is walking with both arms out for balance (Molteno, 1991:33-34; Coovadia & Wittenberg, 1998:26; Nelson & Israel, 2000:23).

3.3.1.2 Manipulation

In the early infant state the hands are tightly fisted with the grasping reflex predominating. By 2 months of age this should be disappearing thus allowing the hands to open. Over the next few months the reaching reflex starts to develop with infants reaching for anything in their grasp. They start transferring objects from one hand to another and by 10 months they are manipulating and picking up small objects between their thumb and index finger. Coovadia and Wittenberg (1981:26) highlights that at 12 months of age this manipulation is taken to a new level in developing the fine pincer grip. This control of the thumb and index finger allows for the laying of the foundation for future activities at school.

Cognitive development impacts on the further development of language and communication, emotional and psychosocial aspects, making the following section essential in understanding development of the infant (Child Development Information. 2006).

3.3.2 COGNITIVE DEVELOPMENT

For over 20 years, the phrase *infant cognitive development* and Piaget's account of it, have been almost synonymous. Piaget divides the child's cognitive development into the following four main stages: **sensorimotor, pre-operational, concrete operations and formal operations** (Piaget, 1954).

Piaget hypothesised that cognitive growth occurs in distinct periods or stages, roughly correlated with chronological age. As with all stage theories, it was assumed that these stages occur in particular sequence and build on preceding ones. For the purposes of this research study the following Table 3.1 and description of Piaget's Stages of Cognitive Growth will only highlight the first **two stages**.

Table 3.1 Piaget's Stages of Cognitive Development

	Cognitive Stages of Development	Age
1	**Sensorimotor stage**	0-18 mths
	1.1 neonatal reflexes	0-1 mth
	1.2 co-ordination of hearing, sight, grasping	1-4 mths
	1.3 co-ordination of hand movements	4-8mths
	1.4 object permanence	8-12 mths
	1.5 complex goal-directed behaviour	12-18 mths
2	**Pre-operational stage**	18 mth-7 years
	2.1 symbolic stage: emergence of symbolic thought, language and play	18-36 months

Adapted from Robertson (1991:246)

3.3.2.1 Stage One: Sensorimotor Period (Birth to 2 years)

Infants become aware of the world through innate sensorimotor reflexes. They organize sensory information into schemas by coordinating the information from various sensory modalities and then integrating them (Nelson & Israel, 2000:25). Behaviour becomes voluntary, refined, integrated and playful. Ability develops mentally to represent the world in images and words.

Infant reflexes give way to more goal-directed behaviour as the infant repeats random movements and actions. Gradually, actions such as grasping become coordinated with hearing and sight until more complex sensorimotor functions like co-ordination of hand movements and the manipulation of objects in the environment become possible. At this point, an infant learns that an object can exist even when it is out of sight, referred to as *object permanence* (Robertson, 1991:247; Westen, 1996:510).

3.3.2.2 Stage Two: Preoperational Period (2-7 years)

This stage refers to the development of a broadened view of the world through an awareness of the environment with the infant attempting to link present experiences with past ones and to classify perceived differences as concepts of space, number, and colour, symbolic thinking and making associations from past experiences. (Nelson & Israel, 2000:25). Language and fantasy play develop rapidly allowing children to deal with varied situations (Coovadia & Wittenberg, 1998:27).

Previous studies have proven that children with Fetal Alcohol Syndrome (FAS) exhibit generalized impairment of mental functioning. Stratton *et al* (1996) and Janzen, Nanson and Block (1995:273-279) found children with FASD exhibiting a broad range of problems with language and memory. Mattson and colleagues (1996:810-816) found that FAS-related learning problems occur during the initial stages of memory formation. Further deficits associated with FAS involve executive functioning; the activities that require abstract thinking, such as planning and organizing (Hunt, Streissguth, Kerr & Olson, 1995:339-342; Mattson *et al*., 1999; Roebuck *et al*., 1999:1070-1076).

The presence of Fetal Alcohol Spectrum Disorder (FASD) would greatly affect the speed and accuracy at which these infants move through the stages of cognitive growth, directly affecting the later formal operational stages in Piaget's cognitive development.

The development of communication skills and language are closely linked to learning and cognition. The following section seeks to describe the development of language and communication.

3.3.3 LANGUAGE AND COMMUNICATION DEVELOPMENT

Language refers to the ability to distinguish and produce sounds, to join sounds into words and then the words into grammatical sentences (Nelson & Israel 2000:26). The newborn infant cries and is unable to produce much more than throaty sounds. By 8 weeks vowel sounds appear which are used to vocalise pleasure. The infant then starts initiating sounds to which the mother responds. By 32 weeks the infant is combining syllables in the form of babbling (Coovadia & Wittenberg, 1998:27). At 15-18months of age the infant begins with symbolization, identifying of objects through their use. At 18 months of age the infant starts uttering two word combinations and by 2 years of age is using pronouns.

At 5 years of age the child is speaking fluently and talking incessantly (Molteno, 1991:34; Coovadia & Wittenberg, 1998:27).

Research conducted on children with Fetal Alcohol Syndrome (FAS) prove that they usually perform relatively well on language tests (Kodituwakku *et al*., 1995:1558-1564), although they tend to have difficulty with complex language tests, especially those addressing the practical aspects of language.

Language is clearly related to intellectual functioning, and is also a social activity. Impairments in language can result in academic problems, social interactional problems, social isolation and a low self-esteem (Nelson & Israel, 2000:26).

3.3.3.1 Personal and Social Development

Some of the earliest emotional resources present in the infant are the *drive to love* and the *drive to work*. Robertson (1991:246) states that in this capacity, "love" includes both self –esteem and significant and suitable relationships with others. By "work", he refers to the ability of using one's knowledge and skills creatively. The emotional and cognitive resources of infants develop in a progressive, sequential manner allowing, however, for the uniqueness of each individual (Coovadia & Wittenberg, 1998:27-28).

The relationship between the mother and child is recognized by means of bonding and through the attachment process. Bonding starts after birth and confirms the mother's acceptance of the infant. The development of the infant's attachment to its mother is a gradual, sensory experience. Bowlby (1977) believed that a child's behaviours in later life depend on the way in which they attach to the mother in the first three years of life, emphasising the importance of this first relationship (Bowlby, 1977). As cited in Milne (2003:130-131) Bowlby believed that a healthy secure attachment develops when the infant has consistent care and feels confident and secure in their parental availability. Infants, however, need to take responsibility for their actions and make choices influencing alternative behaviours.

Erik Erikson, a Freudian psychoanalyst, believed that individuals have the potential to solve their own conflicts, and that competent functioning is achieved through the resolution of a life crisis, occurring throughout the individual's life at various developmental stages (Milne, 2003:126). These psychosocial stages do not occur within a strict chronological framework, as each child is unique and has a personal timetable. However, as in fetal development, each aspect of psychosocial development has a critical period of readiness during which, if it does not thrive, it is likely to weaken (Engler, 1999:146).

For Erikson, the psychosocial development occurs where children try to understand and relate to their world and to others through a gradual series of vital encounters with the environment. It is of the researcher's understanding that through these interactions biological development, psychological abilities, cognitive capacities, and social influences mature.

Erikson divided an individual's lifespan into eight stages, as the subjects of this research study are infants, only the first two stages of the emotional development are included in Table 3.2 and described below.

Table 3.2 Erikson's Psychosocial Stages of Development

Psychosocial Development Stages		
Age	**Category**	**Conflict**
0-1	Infancy	Basic Trust vs. Basic Mistrust
2-3	Early Childhood	Autonomy vs. Shame and Doubt

Although the approximate age period for each achievement is given, in practice there is often an overlap between the stages during the infants' development.

3.3.3.2 Trust vs. Mistrust: Hope

The basic psychosocial attitude to be learned in this stage is whether the world (environment) can be trusted. For a large amount of time, infants are dependent on others for the satisfying of their needs. If infants receive inadequate, unreliable or rejecting care, they will perceive the world as hostile and they will develop a high degree of mistrust (Engler, 1999:147)

An infant who experiences a warm, nurturing environment and care during the first year of life, develops a sense of well being and **trust** towards the environment that will influence all future relationships. As the infant develops, he/ she realizes that others consider him/her when he/she expresses "their own" emotional needs. Appropriate balances of trust and mistrust leads to the development of the ego strength hope, a basic human virtue (Maier, 1969:32).

The development of gross motor and language skills during the first 2 years of life, as described above, makes children more aware of themselves, both physically and emotionally, which leads to a sense of **autonomy.**

3.3.3.3 Autonomy vs. Shame And Doubt: Will

Erikson's second stage arises during the second and third years of life. The primary goal of this stage is that of control over the body and bodily activities as opposed to a tendency of shame and doubt (Maier, 1969:39).

Most children learn how to socialize within the family, either initiating or feeling guilty about the purpose of their interactions. Doubts about a child's ability for self-control might present as feelings of inadequacy or shame. Without this skill, the child is unprepared to make contact with the larger environment, at school, within peer groups and the society. *Will*, the virtue for this stage, refers to will power, a natural outgrowth of autonomy seen as an unbroken determination to exercise freedom of choice and self-restraint (Engler, 1999:147).

It is of the researcher's opinion that many infants with a FASD diagnosis do not have contact with warm, caring and loving relationships in their first years of life. This failure to feel safe, accepted and loved may together with brain abnormalities present from alcohol exposure, impact on their ability to trust others, make contact with their environment and satisfy their needs. If the infant with FASD does not receive stimulation and feel accepted, it is the researcher's opinion that these children will have difficulties making contact at the contact boundary. These gaps in contact may lead to an unfulfilled sense of self-awareness and impact on the awareness of others.

In all stages of development namely psychomotor, cognitive, and emotional, the senses play a vital role in integrating the infant into the environment. During the first 3 months, early mother-child relationships are based on the response of the mother to the infant's cues. From there the relationship develops, through the use of all the infants senses, such as vocal, hearing, sight, and touch (Nelson & Israel, 2000:24).

Due to the nature of this study, and the importance of the senses on self -awareness, the following seeks to place emphasis on the development of the infant's senses.

3.4 DEVELOPMENT OF THE SENSES

The development of the senses is an important component to the awareness of an individual's emotions and behaviour. Levine and Shefner (in Schoeman, 1996:41) refer to sensation as being the process of detecting a stimulus in the environment. It is the researcher's opinion that perceptions about the self and the world are influenced through the information collected through the senses.

The following describes the sensory functions used by the infant, in the assimilation of information from the environment. This information is then used, as discussed above in Section 3.2.1.3 to self-regulate the infant, building self-awareness and a sense of self.

3.4.1 VISION

The infant's **vision** is a primary sense coordinating other senses and stimulating his cognitive perceptions (Schoeman, 1996:43). Through vision, the infant can become aware of his environment, make contact with others, and assimilate that which is needed to satisfy his/her dominant needs.

3.4.2 HEARING

The infant uses his sense of **hearing** before he is even born, becoming aware of the sounds of his mother's body and her voice (Schoeman, 1996:145; Oaklander 1988:114). Blom (2004:101) maintains that infants who do not have contact with sounds will have difficulty in making contact at an interpersonal level with others and the environment, as well as at an intrapersonal level, with their own connected feelings. Infants can use their sense of hearing to assess their environment and assimilate what is needed to satisfy a dominant need used to develop schemata of experiences.

3.4.3 SMELL

The sense of **smell** is used to gather information about the environment. It assists the infant in perceiving the moment in the present, essential for making contact and satisfying the dominant need. A schemata is essential when trying to associate past experiences with present ones (Nelson & Israel, 2000; Blom, 2004:107).

3.4.4 TASTE

The **taste** sense is linked to several other impulses, which assists the infant in perceiving the environment and their own process and feelings. It also plays an important part in the verbalization of these emotions, allowing contact to take place and the assimilation or rejection in achieving the dominant need (Oaklander, 1994: 119; Schoeman, 1996: 46-47; Blom, 2004:106).

3.4.5 TOUCH

People depend on their sense of **touch** for information. When people touch something with either their hands or feet, they get a sense of what it really is and more importantly, whether they like it. An infant's development depends on his ability to touch and make physical contact with other human beings. Schoeman (1996:47) highlights the importance of touch for socialization, especially during the first years of life.

Infant development is not only comprised of psychomotor and cognitive development. Many aspects of development play an integral part in the overall growth of an infant and a child. Infants with a Fetal Alcohol Spectrum Disorder diagnosis begin their developmental stages with a disadvantage, due to the damage done by prenatal alcohol exposure. Although a warm, caring, stimulating environment may assist the development of these infants, many find themselves in poor, abusive, non-stimulating environments which together with the structural abnormalities hinder a normal development over most facets, as discussed above.

3.5 CONCLUSION

In this chapter an overview of the key gestalt concepts associated with this research were described, as well as an understanding of the psychomotor, emotional and cognitive development of an infant unaffected by Fetal Alcohol Syndrome. Due to the importance of the sensory functions especially as part of Piaget's sensorimotor stage of cognitive development, senses were discussed with reference to infant development. Prenatal alcohol exposure damages key areas of the brain, distressing sensory functions of an unborn infant. Fetal Alcohol Spectrum Disorder (FASD) children display 'abnormal' behaviours, primarily related to the damage done to the brain. Further delays may be caused by the inability of children with Fetal Alcohol Spectrum Disorder (FASD) to make positive contact with their environment, which would affect the information they assimilate, integrate and self regulate.

In the following chapter the research, methodology used is described and results are integrated into the literature of the study.

CHAPTER FOUR

4 RESEARCH METHODOLOGY: AN EMPIRICAL PERSPECTIVE AND INTEGRATION OF FINDINGS

4.1 INTRODUCTION

Chapter Three sought to integrate the Gestalt perspective into the research and focused on the development of an infant through various stages with particular reference to 7-29 months of age, relative for the subjects in the study. This chapter presents the empirical findings of the research. The hypotheses, goals and objectives guiding the study as stated in Chapter One, introduce the discussion.

The hypotheses are statistically tested and other significant correlations in the study are highlighted. Findings related to the Griffiths Mental Developmental Scale (GMDS), the instrument used, as well as related findings are discussed. Graphical representations, with reference to the research methodology, of the findings conclude this chapter.

4.2 RESEARCH PROCESS REVIEWED

In order to place the empirical results presented in Chapter Four into context, it is necessary to revisit the **exploratory** research process as discussed in Chapter One, with particular reference to the research hypothesis, goals and objectives.

This research followed a **non-experimental, ex post facto, correlational design**. The main goal was to compare the neurodevelopmental subscales of infants diagnosed with Fetal Alcohol Syndrome, Partial Fetal Alcohol Syndrome and non-Fetal Alcohol Syndrome over two developmental age phases.

To achieve the above goal the following objectives were formulated:

- To provide a theoretical foundation by exploring, describing and reviewing the features associated with FASD through a literature review including clinical diagnosis of Fetal Alcohol Spectrum Disorder (FASD) and reference to the cognitive, behavioural and sensory implications associated with FASD and the importance of a FASD diagnosis at infancy
- To provide an integration of Gestalt concepts with reference to the developmental phases of infants

- To highlight delays in the developmental scales of FAS, PFAS and Non-FAS infants over two assessments at 7-12 months of age (First Assessment) and 17 –29 months of age (Second Assessment). Analysis of these infant developmental distributions would allow for the creation of longitudinal developmental profiles

It is necessary for the researcher to confirm the hypothesis and methods of data collection before the empirical results are presented. The following hypothesis guided this study:

Hypothesis 0: ***The neurodevelopmental profile of a Fetal Alcohol Spectrum Disorder affected infant does not illustrate more delay at the 17-29 month assessment compared to the 7-12 month assessment.***

Hypothesis 1: ***The neurodevelopmental profile of a Fetal Alcohol Spectrum Disorder affected infant illustrates more delay at the 17-29 month assessment compared to the 7-12 month assessment.***

As described in Chapter One, this neurodevelopmental study forms part of a retrospective, prevention study conducted by FARR. In order to appreciate the research process used and the purposive, non-probability sample selected for this study (n= 74), attention needs to be given to the methods used in ascertaining this sample from the larger retrospective data.

Figure 4-1 below serves as an illustration detailing the retrospective data collection procedure used over two phases.

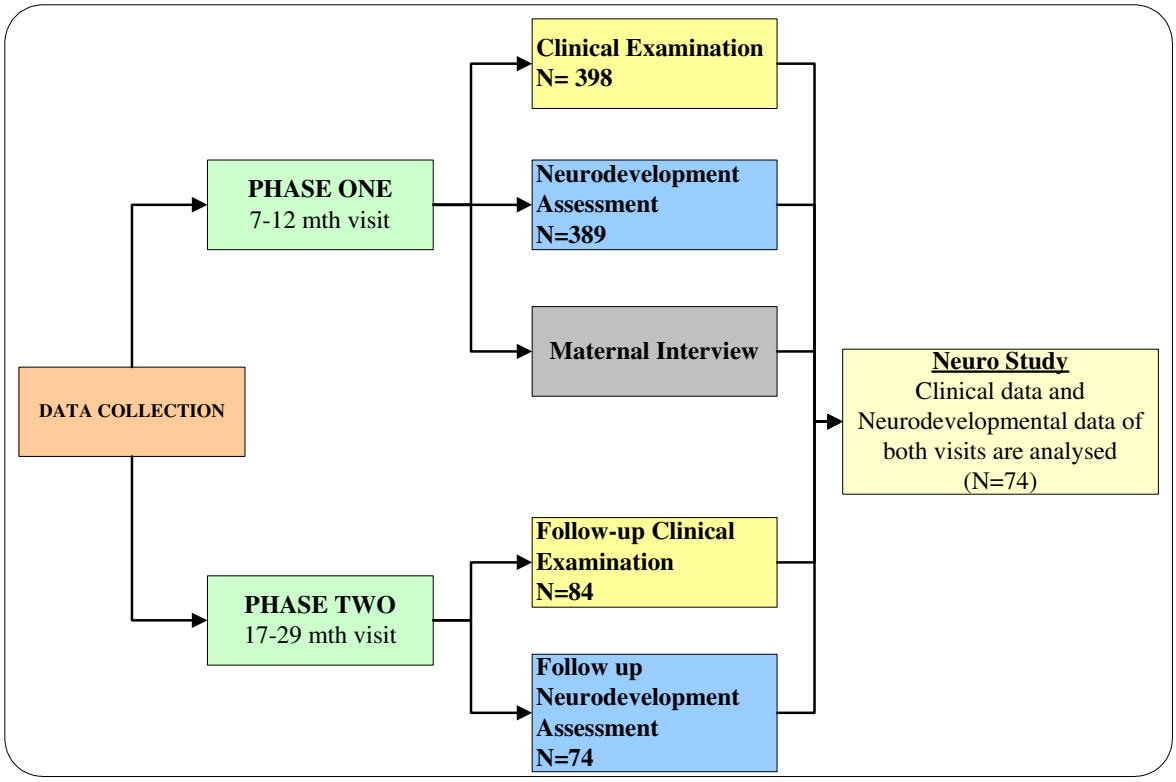


Figure 4-1 Flowchart illustrating the retrospective study

Figure 4-1 details the data collection method used in the research. In Phase One, infants aged between 7-12 months were clinically examined by two trained genetic clinicians, (skilled in diagnosing FASD). Examinations were conducted independently, maintaining interrater-reliability. Infants were assigned a diagnosis of either:

- Fetal Alcohol Syndrome (FAS)
- Partial FAS (PFAS) or
- Non-FAS diagnosis, allocated to infants not showing characteristics of FASD

A neurodevelopmental assessment was administered to these infants (First assessment), using the Griffiths Mental Developmental Scale (GMDS). Mothers of infants clinically diagnosed as having FAS, PFAS or a Non-FAS diagnosis were interviewed using a structured maternal interview, developed and tested for local populations. The maternal history of alcohol was identified in these interviews as well as general demographic information such as marital status, maternal education and level of schooling.

A case conference was held where all members of the multidisciplinary team shared evidence of their findings in confirming a final diagnosis. Affected individual's parents and controls were invited back for a follow-up assessment.

In Phase Two the parents of infants aged between 17-29 months were invited to bring their children back for a follow-up clinical examination. A neurodevelopmental assessment (Second assessment) was administered on some of these infants, as some families seen in Phase One had moved out of De Aar, or the infant or mother had passed away thus reducing the sample size of Phase Two.

This study sought to analyse the neurodevelopmental performance of the FAS, PFAS and Non-FAS infants and compared the neurodevelopmental profiles over both the Phase One and Phase Two of the data collection study.

The three-fold approach, as described above, in assigning a FASD diagnosis or selecting controls can be referred to as **triangulation,** as discussed in Chapter One**.**

4.3 THE GRIFFITHS DEVELOPMENTAL SCALE (GMDS)

This scale forms the measuring instrument used in the study. In order for the reader to understand the empirical results the following will be clarified:

4.3.1 TEST ADMINISTRATION

In this study neurodevelopmental assessments were administered to infants from Phase One and Phase Two by the researcher and a colleague. Both examiners had no prior knowledge of the infant's clinical diagnosis and this "blind" contact was maintained throughout the testing process to prevent experimenter-expectancy bias, which refers to the amount of bias an experimenter may or may not have if one knows the diagnosis of the infant prior to the assessment.

The assessments took approximately 90 minutes in large, quiet rooms where external distractions were avoided. Parents/caregivers were included in the testing process, and infants sat on their laps during the assessment in an attempt to decrease infant anxiety. Parents/ caregivers were also requested to answer self-report questions as part of the Griffiths Mental Developmental Scale (GMDS) allowing for information on the infant's development at home.

The Griffiths Mental Development Scales (GMDS) from Birth to 2 years was administered to all infants participating in the Phase One the first visit. Due to logistical constraints, some infants were older than 2 years at the Phase Two follow up visit- therefore the Griffiths Mental Development Scales/ Revised (GMDS-R) were used, as detailed in Chapter One. An example of the test form and consent are attached as (Appendix 3).

4.3.2 SCORING

The psychometrist responsible for administering the GMDS was responsible for scoring of the test. Developmental scores were calculated for each of the five subscales: locomotor, personal and social, speech and hearing, eye-hand coordination and general performance. Raw scores for each subscale and the total General Development Quotient (DQ) were calculated. A Sub-Quotient is a final score, showing how the infant's total score varies around the total mean, with a mean of 100 and a standard deviation of 16 (Griffiths, 1996).

These scores were standardised and converted to sub-and general quotients, using Tables 21 in the GMDS Manual (Griffiths, 1996:89-112). These five scores were added together and then divided by 5 to get the total developmental quotient (DQ) of the infant. These scores are then allocated to a specific developmental category, with reference to the above table; an infant with a DQ of 88 would be below average in their development and would be placed into category 6.

These categories of development, described below in Table 4.1 can also be described as being ordinal data, scores assigned to categories, which can then be ranked (Burns & Grove, 2001:393). The quantity of data can be identified, through the GMDS scores attained. However, the intervals between the ranked categories may not be equal. Due to the difference in interval size between the categories a non-parametric statistical test was used.

In cases where an infant's subscale raw scores were below the point of being converted to standard scores using the Tables 21 in the GMDS manual, they were calculated as being the lowest possible score (Griffiths, 1996:96).

Table 4.1 Developmental Categories - Griffiths Mental Developmental Scale

Developmental Quotient Category	Developmental Description	Quotient Score
10	Very Superior	130 +
9	Superior	120-129
8	Above (High) Average	110-119
7	Average	90-109
6	Below (Low) Average	85-89
5	Borderline	70-84
4	Mild mental retardation	50-69
3	Moderate mental retardation	35-49
2	Severe mental retardation	20-34
1	Profound mental retardation	20 <
		Dr Lorna Jacklin (2005:13)

Non-parametric tests are used when the variance of the study sample drawn from a population does not portray equal distribution. (Burns & Grove, 2001:487). In order to analyse the distribution of infant development over various subscales, the Wilcoxan Rank Sum Test, as defined shortly, was used to determine a level of significance between the infant's 7-12 month and 17-29 month developmental assessments. This non- parametric test examines changes in direction and magnitude that occur between pre-test and post-test measures (Burns & Grove, 2001: 575).

4.3.3 DATA CAPTURE

For the purpose of this study, data was entered for each infant according to their performance on all the subscales, as well as the total developmental quotient assessed by the Griffiths Mental Developmental Scales (GMDS). These scores were categorised within the developmental categories as presented above in Table 4.1. The infant's final clinical diagnosis of FAS, PFAS or Non-FAS as allocated by the clinicians in the retrospective study, previously discussed, was also considered for the first and second neurodevelopmental assessments.

Statistical analyses were preformed due to the quantitative nature of the study. Prior to the commencement of any of the below analyses, one-way frequencies were generated to check for missing data. Levels of significance were ascertained through the use of a two-tailed statistical

test, the *Wilcoxan Signed Ranks* test that will be discussed shortly. The analyses were as follows:

4.4 DESCRIPTIVE STATISTICS

Descriptive statistics allows for the re-organisation of data to facilitate insight and to examine the relationships being tested (Burns & Grove, 2001:499). In order to describe the participants used in the study, the following information is presented in figure form below:

1) Infant sample at 7-12 months and 17-27 month assessments
2) Gender of infants
3) Ethnicity of the infants in the sample

4.4.1 ASCERTAINMENT OF FINAL DEVELOPMENTAL SAMPLE

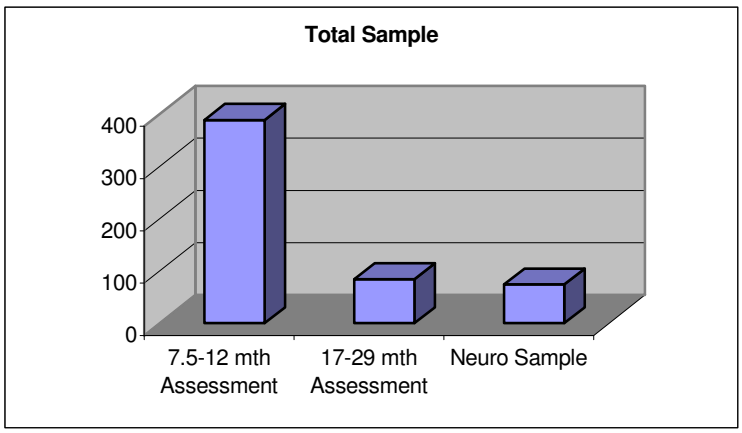


Figure 4-2 The Total Sample

Due to the retrospective nature of this study, above seeks to demonstrate how the sample group for this research study was ascertained. As discussed above in Section 4.2, neurodevelopmental assessments were administered to 389 infants at the first assessment (7.5-12 month). Of those, only 84 neurodevelopmental assessments were administered at the second assessment (17-29 month), due to logistical constraints, thus the final neurodevelopmental sample group for this study was 74 infants.

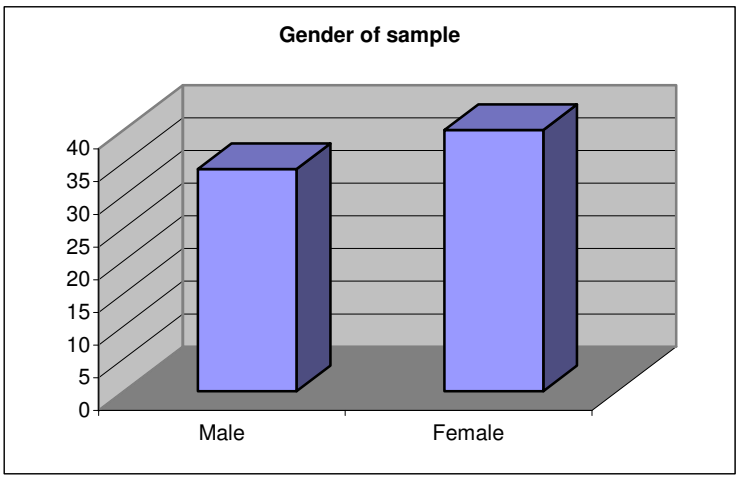


Figure 4-3 Gender distribution of study sample

Figure 4-3 represents the gender distribution of the total sample used with 46 % (n=74) of the sample group being male and the larger portion at 54 % (n=74) of the total sample being female.

4.4.2 ETHNIC DISTRIBUTION

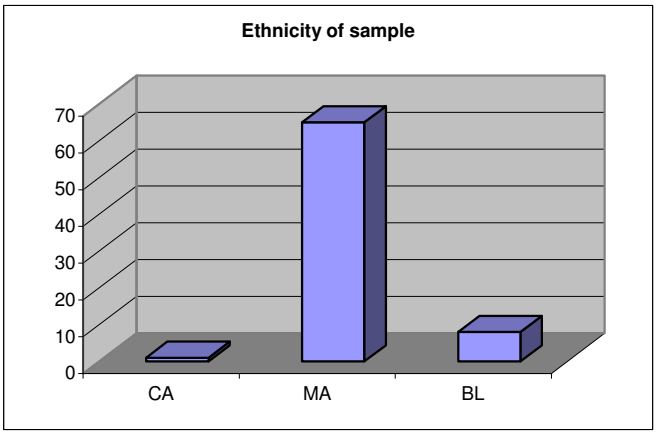


Figure 4-4- Ethnic Distribution of the Study Sample

Figure 4-4 demonstrates the distribution of ethnicities of the sample used in this research study. The mixed ancestry (coloured) population make up 87.8% of the sample; only 10.8% of the black population are represented with 1.4% of the white population being represented.

4.5 WILCOXAN SIGNED RANKS TEST

The *Wilcoxan Rank Signed Ranks* test is designed to test a **hypothesis** about the location (median) of a population distribution. A difference *(d)* score is calculated between the scores in an attempt to determine the distribution of the scores. (Burns & Grove, 2001)

4.5.1 FIRST ASSESSMENT - SUM OF RANKS 7-12 MONTHS

The developmental total scores attained by infants' aged 7-12months of age were ranked and added together to determine the sum of rank score. **Table 4.2** below illustrates the sample size of **74** infants and the sum of their developmental scores as ranked. The Sum of ranked developmental scores for **all** infants (n=74) at 7-12months of age is **7325**.

This provides the total developmental score for all infants when assessed at 7-12 months of age, which can be compared to the total developmental score of infants at 17-29 months of age, as described below.

Table 4.2 The Wilcoxan Sum of Ranks Test /1'st Assessment -Age = 7-12 months

7-12 Month Sample (T1)	
Sample Size	74
Sum of Ranks	7325

4.5.2 SECOND ASSESSMENT- SUM OF RANKS 17-29 MONTHS

The developmental total scores attained by the same infants aged 17-29 months of age were ranked and added together to determine the sum of rank score, as above. Table 4.3 below illustrates the sample size of **74** infants and the **sum** of their developmental scores as ranked at 17-29 months of age as **3701**.

Table 4.3 The Wilcoxan Sum of Ranks Test/ 2'nd Assessment-Age= at 17-29 months

17-29 Month Sample (T2)	
Sample Size	74
Sum of Ranks	3701

At face value, the sum of ranks between the first assessment at 7-12 months of age (**7325**) and the second assessment at 17-29 months of age (**3701**) are significantly different. All infants, regardless of their FASD diagnoses, tended to perform developmentally better at their first

assessment at 7-12 months of age than later on at their second assessment at 17-29months of age.

4.5.3 THE STATISTICAL LEVEL OF SIGNIFICANCE

In table 4.4 below both, the first and second assessment samples are added together (**n=148**). The following **z-score** formula is used to determine the level of significance (Burns & Grove, 2001:576):

$$Z = \frac{T - \frac{N(N+1)}{4}}{\sqrt{\frac{N(N+1)(2N+1)}{24}}}$$

Table 4.4 The Level of Significance

SIGNIFICANCE LEVELS	
Level of significance	0.5
Total Sample size n	148
T1 Test Statistic	7325
T1 Mean	5513
Z Test Statistic	6.94902641
TWO-TAILED TEST	
***p*-value**	**3.701E-12**
	Reject the Null Hypothesis

Table 4.4 also demonstrates the two-tailed test used to measure the developmental level of significance between the first sample (T1) at 7-12 months of age and the second sample (T2) at 17-29 months of age.

After calculating the z-score value and standard error of measurement, the p-value attained was calculated at 3.701E-12, which at a significance level of 0.05 would reject the following null hypothesis:

Hypothesis 0: *The neurodevelopmental profile of a FASD affected infant does not illustrate more delay at the 17-29 month (Second assessment) compared to the 7-12 month (First assessment).*

Thereby **accepting the alternative hypothesis**,

Hypothesis 1: *The neurodevelopmental profile of a FASD affected infant illustrates more delay at the 17-29 month (Second assessment) compared to the 7-12-month (First assessment).*

The statistical significance as proven above accepts the hypothesis but the following inferential analyses describes which of the subscales of the Griffiths Mental Developmental Scales are more heavily implicated, over the various FASD diagnoses.

4.6 INFERENTIAL STATISTICS

The following section comprises the neurodevelopmental profiles of infants with FAS, PFAS and Non-FAS derived from the results of the subscales Griffiths Mental Developmental Scales (GMDS), and classified into the categorises as described above in Section 4.3.2.

4.6.1 INFANTS DIAGNOSED WITH FAS

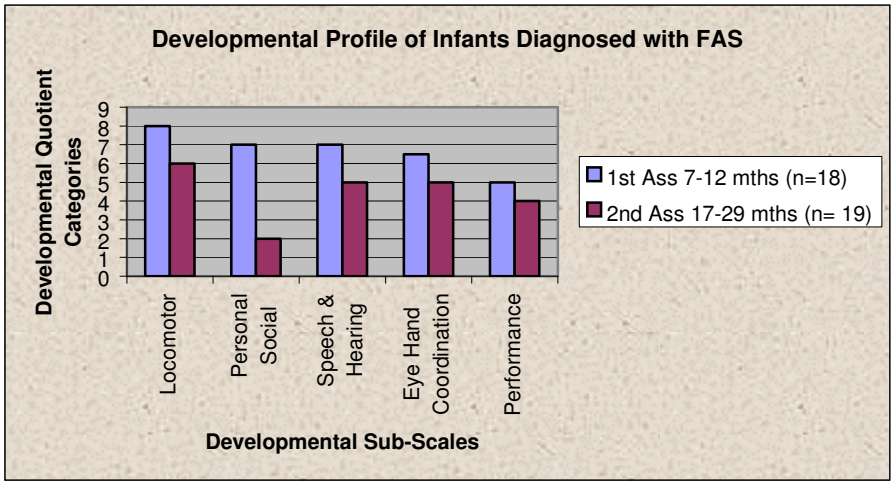


Figure 4-5 Fetal Alcohol Syndrome Developmental Profile

Figure 4-5 demonstrates the developmental profile of infants with Fetal Alcohol Syndrome (FAS) diagnosis and highlights the first assessments conducted at 7-12 months and then the second assessment at 17-29 months of age.

The categories on the y-axis, titled; *Developmental Quotient Categories*, can be understood with reference to the Griffiths Categories of Development (Table 4.1). As shown above, infants with FAS display an **average (7)** development over most of the subscales of development The first assessment sample (n=18) of infants with FAS seen at 7-12 months of age show their locomotor development as being the highest, most developed subscale and reaching well into the **above average (8)** category. Their two lowest subscales are eye-hand coordination between **average and below average (6.5)** and their performance scale at **borderline (5).**

When comparing the first assessment to the second assessment (n=19), an obvious picture emerges as to the deterioration of the performance over **all** subscales of the Griffiths assessment. The Personal & Social subscale is most affected, dropping from an **average (7)** score at 7-12 months of age to **severe mental retardation (2)** at 17-29 months of age, illustrating a 4-category *drop*.

Any *drops* in categories over all the subscales, as detailed in the x-axis of the graphs will be described in more detail in Chapter Five. The researcher included them in Chapter Four merely to highlight the subscales of the infants with substantial developmental delay.

4.6.2 INFANTS DIAGNOSED WITH PFAS

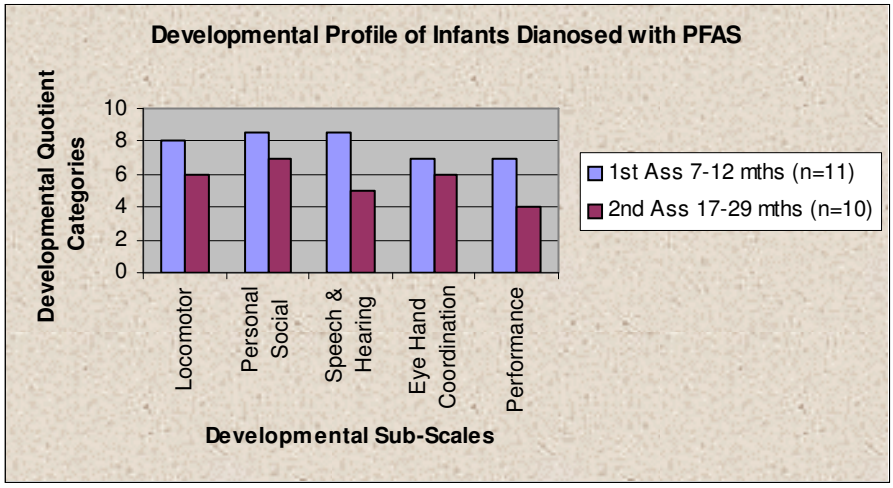


Figure 4-6 Developmental Profile of Infants Diagnosed with PFAS

The developmental profile of infants with Partial FAS is demonstrated above in Figure 4-6. The first assessment sample (n=11) of infants aged 7-12 months with PFAS performed within the **above average (8) and superior (9)** categories over most of the developmental subscales,

with the strongest subscales being Personal and Social and Speech and Hearing. The weakest subscales are Eye and Hand coordination and General Performance, both reaching an **average (7).** When the second assessment (done at 17-29 months of age (n=10) results are compared to the first assessment, a marked reduction in development over **all** subscales is evident, with particular reference to the Speech and Hearing subscale moving from an **above average (8), superior (9)** score *down* to **borderline (5).** The Performance subscale also moves *down* 3-categories from **average (7)** to the **mild mental retardation (4)** category.

4.6.3 INFANTS DIAGNOSED WITH NON- FAS

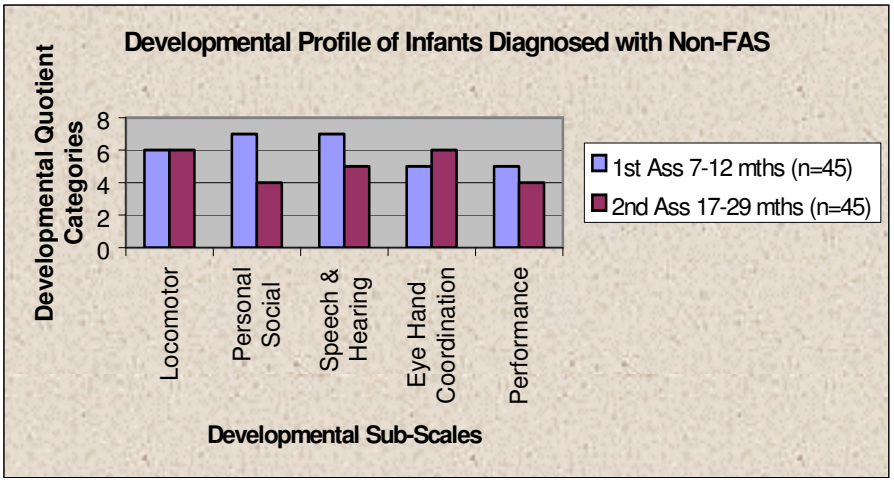


Figure 4-7 Developmental Profile of Infants Diagnosed with Non-FAS

The developmental profile of infants with a non-FAS diagnosis as illustrated above in Figure 4-7 can be interpreted as follows. At 7-12 months of age (n= 45) infants performed above the **borderline** category **(5)** over **all** developmental subscale, with the weakest developmental scales being that of Eye and Hand coordination and Performance, both at **borderline (5).** The strongest developmental scales of infants not affected by FAS are the Personal- Social and Speech and Hearing scales, both scoring within the **average (7)** developmental category.

When the later assessment scores at 17-29 months of age are compared to the scores at the first assessment an erratic distribution occurs. The Locomotor scale remains constant at **Below Average (6),** and an increase from **borderline (5)** to **below average (6)** occurs over the Eye-Hand coordination. The weakest scale of development at the second assessment is the marked reduction in development of the Personal & Social subscale, with a 3- category *drop* from

average (7) to **mild mental retardation (4).** There is a delay in the Speech and Hearing subscale *dropping* down from **average (5)** to **borderline (5)** and the Performance subscales *dropping* from **borderline (5)** to **mild mental retardation (4)** when compared to the first assessment done at 7-12 months of age.

4.6.4 FASD DEVELOPMENTAL PROFILE

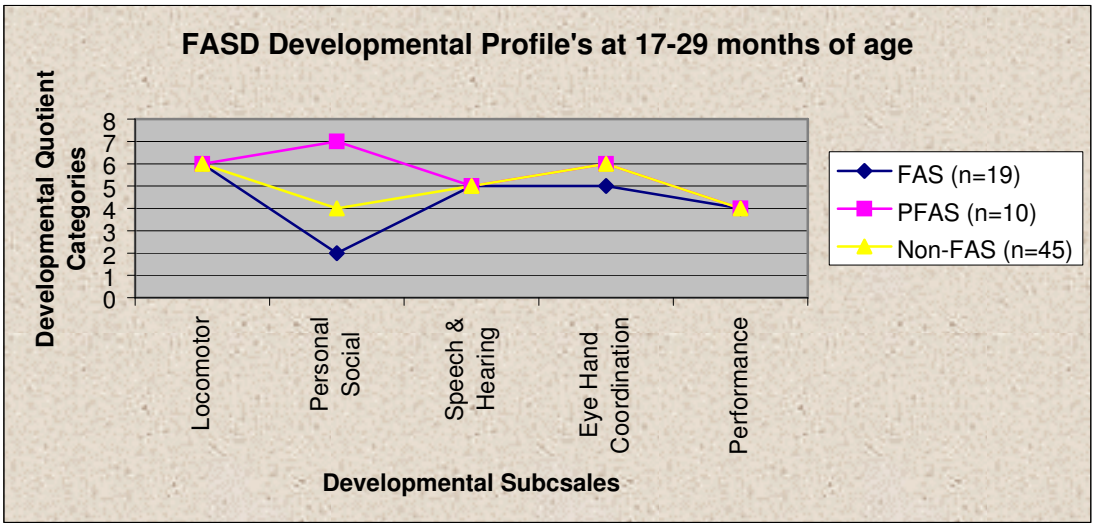


Figure 4-8 FASD Developmental Profile's at 17-29 Months of Age

Figure 4-8 demonstrates graphically the developmental profile of infants with a FAS, PFAS and Non-FAS diagnosis over the developmental subscales of the Griffiths Mental Developmental Scale (GMDS). The infants with a FAS diagnosis perform worse over most of the developmental subscales when compared to the performance of the PFAS and Non-FAS infants.

The PFAS performed better than the Non-FAS infants over the first two developmental subscales: Locomotor and Personal Social. PFAS infants meet the Non-FAS infants at the third developmental subscale, Speech and Hearing and follow the Non-FAS distribution of performance through to the Performance scale.

The Non-FAS infants followed a similar curve distribution however, performed at least 2 categories better than the infants with FAS.

4.6.5 AVERAGE FASD DEVELOPMENTAL DELAY OVER CATEOGIRES OF THE GRIFFITHS

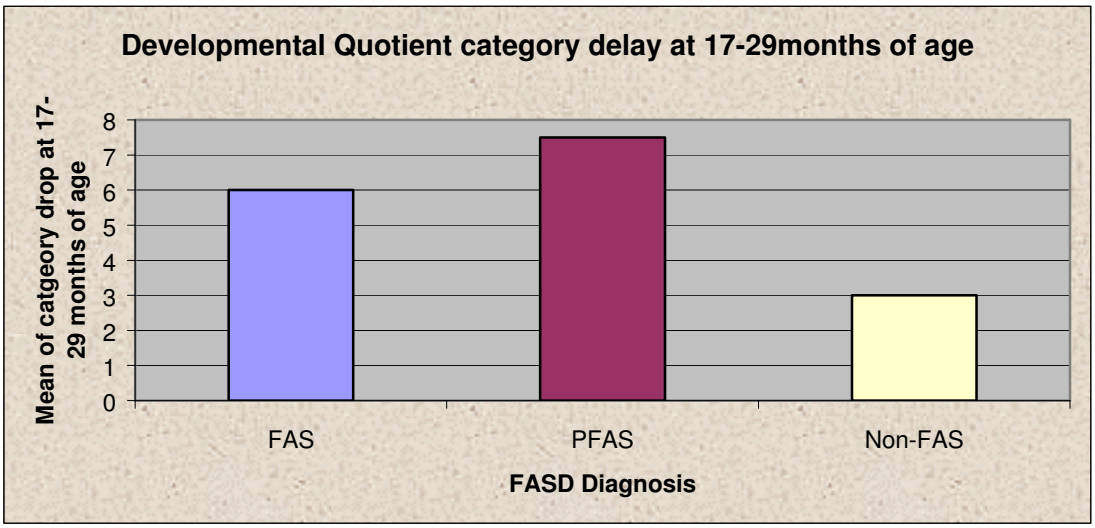


Figure 4-9 Developmental Quotient Category Delay at 17-29 Months of Age

In an attempt to ascertain which FASD category displayed the largest drop in developmental performance at 17-29 months of age, the researcher calculated the mean category from each diagnosis. Figure 4-9 above illustrates that infants with a FAS diagnosis dropped an average of 6 categories over all developmental subscales at the 17-29 month assessment.

The development of the infants with a PFAS diagnosis was most affected, with an average 7.5 drop over all categories of the GMDS at 17-29 month of age.

The infants with a Non-FAS diagnosis also dropped in developmental performance at 17-29 months of age, with a 3-category drop.

4.7 CONCLUSION

Chapter Four sought to test the hypothesis stated in Chapter One. Of the 74 infants making up the sample, 46 % were male and 54% female. The mixed ancestry ethnicity accounted for the largest portion of the population included in the study at 87.8%, due to the majority of this ethnic group in the community. The black population made up 10.8% of the sample, and the white population substantially lower at 1.4%.

The hypothesis as introduced in Chapter One was supported through the findings that there was a significant difference between the developmental performance of FASD infants at 17-29 months of age when compared to their 7-12 month assessment.

In an attempt to clarify the differences, the researcher illustrated the developmental profiles of the infants with a diagnosis of FAS, PFAS and Non-FAS individually to ascertain which specific developmental subscales were implicated in maternal alcohol consumption, and which were significantly delayed at a later developmental phase.

Infants with a FAS diagnosis demonstrate an overall delay in performance over all developmental subscales at 17-29 months of age, with the most affected subscale being that of the Personal and Social.

Infants with a PFAS diagnosis perform better than the infants with a FAS diagnosis at the 7-12 month assessment, but also present with more delayed developmental performances at 17-29 months when compared to their earlier developmental performances.

Infants with a Non-FAS diagnosis did not perform as well as the infants with a PFAS diagnosis at 7-12 months of age and performing better than the infants with a FAS diagnosis. The non-FAS infants' developmental performance dropped at their 17-29 month assessment with 3 of the 5 categories having moved down in developmental performance. However there was an increase in developmental performance in 1 subscale and in another the same performance, which differs from the above- mentioned, decrease over all scales for both FAS and PFAS diagnosed infants.

A more detailed discussion of the results presented in this chapter, as well as conclusions, limitations and recommendations will be presented in Chapter Five

CHAPTER FIVE

5 AN INTEGRATED SUMMARY OF CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter seeks to relate the literature to the important empirical findings of this study with the intention of supporting the research hypothesis. The literature review concluded that maternal alcohol consumption during pregnancy affects the physical, neurological, cognitive and behavioural development of children. The increasing rates of FAS in South Africa, has created an urgent need to diagnose FAS in infancy, with particular attention to the neurodevelopment of the infant. Development of an infant is the most obvious with reference to delay, which can be monitored by the caregivers.

The **main goal** of the study was thus to "*evaluate the neurodevelopmental subscales of infants diagnosed with a Fetal Alcohol Spectrum Disorder diagnosis of either; Fetal Alcohol Syndrome (FAS), Partial Fetal Alcohol Syndrome (PFAS) or non- Fetal Alcohol Syndrome, at different stages of infancy."*

The research study was guided by a hypothesis and specific objectives as introduced in Chapter One, which will be used to discuss the findings in Chapter Five. Conclusions, limitations and future recommendations, conclude this chapter.

5.1.1 HYPOTHESES REVISTED

From the reviewed literature the following describes the null hypothesis and the alternative hypothesis for this study.

Hypothesis 0: ***The neurodevelopmental profile of a FASD affected infant does not illustrate more delay at the 17-29 month assessment compared to the 7-12 month assessment.***

Hypothesis 1: ***The neurodevelopmental profile of a FASD affected infant illustrates more delay at the 17-29 month assessment compared to the 7-12-month assessment.***

Infant development moves through various stages allowing for an infant to master the required activities. Examples of some early gross motor/ locomotor milestones are the infant's ability to sit, crawl, stand, walk and then run (Nelson & Israel, 2000). It is acceptable to conclude that all infants should progress through the stages of development, at a varying pace. It is of the researcher's opinion that the first stages of developmental progression are required and compulsory for future development of the infant. However, at a later developmental stage, the gap between mastery and delay may become more apparent especially when the delay could be attributed to mental retardation. Appropriate recognition of delay is necessary for early intervention.

Infants examined by Van der Leeden and colleagues (2001:127-134) show similar findings. In this research study, infants exposed to alcohol prenatally were examined at 3 months of age and again at 7 months of age. An age-adequate neurological examination showed no significant difference at 3 months between infants but a significant difference at 7 months of age (Van der Leeden *et al.*, 2001:127-134). Biological programming is suggested by the fact that growth follows a standard sequence for almost all infants and children (Nelson & Israel, 2000:23).

It is for this reason that the null hypothesis, as stated above is rejected accepting the alternative hypothesis, proving that:

> *The neurodevelopmental profile of a FASD affected infant illustrates more delay at the 17-29 month assessment compared to the 7-12-month assessment.*

5.1.2 RESEARCH PROBLEM REVISITED

In accepting the hypothesis, it is important for the researcher to integrate the following research problem as described in Chapter One:

How do the neurodevelopmental subscales differ in infants diagnosed with FASD at various developmental levels?

The following section seeks to answer the research problem and accept the hypothesis of the study, rejecting the null hypothesis, with reference to the findings in Chapter Four.

5.2 ANSWERING THE RESEARCH PROBLEM

In attempting to prove the above-mentioned research problem, special attention was paid to the neurodevelopmental profile of infants with a FAS, PFAS or Non-FAS diagnosis. The Griffiths Mental Developmental Scales were used to assess infant developmental delay. This instrument

was selected due to the availability of norms for the South African population (Luiz *et al.*, 2001:73).

After proving a significant difference between the total developmental quotients at 7-12 months of age and 17-29 months of age of each, particular attention was placed on each diagnosis, namely: FAS, PFAS and Non-FAS profile performance. These will be discussed accordingly.

5.2.1 DEVELOPMENTAL PROFILE OF INFANTS WITH FAS

Infants diagnosed with FAS performed weaker on their 17-29 month developmental assessment than on their 7-12 month assessment. The first assessment sample, at 7-12 months of age (n= 18) showed the Locomotor subscale as being the highest category, reaching above-average on the developmental quotient categories. The two lowest developmental subscales were Eye-Hand coordination, reaching between average and below average and the Performance subscale reflecting borderline developmental performance.

When this 7-12 month developmental profile is compared to the developmental performance of the same infants at 17-29 months of age (n=19) a marked difference in development is observed. The categories at 17-29 months of age illustrate a decrease of 2- categories over all developmental subscales, with the Personal and Social subscale being most affected a 4-category decrease was noted in developmental performance, moving down from average to the severe mental retardation category.

The above findings indicate that infants with a FAS diagnosis perform poorer on Personal and Social, Eye-Hand Coordination and Performance developmental scales when assessed over two various developmental phases.

Coles and colleagues (1991) proved that prenatal alcohol exposure was associated with an increased level of irritability during infancy, a temperamental variable known to contribute to poorer maternal attachment and behavioural problems in childhood (Kelly *et al*., 2000).
Previous researchers describe the damage prenatal alcohol exposure causes to orbi-frontal brain regions, which are directly associated with an individual's social and behavioural performance (Rolls *et al*., 1994; Damasio, 1994).

The infants in this study may have performed more poorly on the Personal- Social subscale due to their level of irritability, their inability to form healthy, relationships with others or damage to specific brain regions.

This decrease in overall developmental performance is of concern but not unexpected due to the permanent damage done to the brain through maternal alcohol consumption during pregnancy. Research has shown that damage to key brain regions impacts on the overall performance of children and infants (Mattson *et al.*, 2001:186).

Previous research conducted by Adnams *et al* (2001:557-562) on children aged 7 years of age, used the Griffiths Mental Developmental Scales (GMDS) to understand the patterns of cognitive-motor development in children with Fetal Alcohol Syndrome (FAS) from a community in South Africa. Findings indicated that children with FAS performed significantly worse than the control group over four Griffith's scales, namely: Hearing and Speech (language), Eye and Hand Coordination (fine motor), Performance (pattern construction) and Practical Reasoning.

It is of interest to the researcher that there is a similarity in the subscales- Eye and Hand coordination and Performance, over two different stages of child development. This indicates that if infants with a FAS diagnosis do not receive early intervention, specific developmental subscales measured at 7 years of age may indicate an infant as being developmentally delayed. This delay in the above- mentioned subscales in infancy would contribute to later disabilities and developmental delay in language skills, visual-spatial functioning, fine-motor behaviour, nonverbal learning and general academic performance (Streissguth *et al*., 1991:1961-1967; Mattson *et al*., 1998:146-153).

5.2.2 DEVELOPMENTAL PROFILE OF INFANTS WITH PFAS

The developmental profile of infants diagnosed with Partial FAS is illustrated in Chapter Four, Figure 4-6. A similar pattern to the one described above in infants with a FAS diagnosis can be seen with the infants with PFAS. At their first assessment (n=11) infants with PFAS perform within the above- average and superior developmental categories over most of their developmental subscales with the strongest subscales being that of Personal and Social, as well as Speech and Hearing.

The weakest subscales, Eye-Hand coordination and the Performance scales are the same scales as implicated in infant with FAS profile. When the first assessment developmental profile of the infants diagnosed with PFAS was compared to the second assessment (n=10), a marked reduction over all subscales of development is evident. Developmental performance on the Speech and Hearing subscale moved down between 4-categories from superior/above-average to borderline and impacted on the Performance subscale which moved down 3-categories to mild mental retardation.

Partial FAS (PFAS) is a relatively new term used to differentiate between a full FAS diagnosis and a Partial FAS diagnosis (See Chapter Two). In the study conducted by Adnams *et al* (2001) a PFAS diagnosis would have been included into the FAS category. The delayed development of the infants with PFAS over the Speech and Hearing subscale of the Griffiths assessment, was also identified in the children aged 7 years of age in the study conducted by Adnams *et al* (2001), thus confirming the importance of early identification of developmental delay.

Previous research conducted by Kodituwakku *et al* (2001:192-198) referred to children with heavy prenatal alcohol exposure (both with and without FAS) and demonstrated impairments on executive functioning tasks (Kodituwakku *et al*., 1995:1558-1564; Mattson *et al*., 1999:1808-1815). Executive functioning refers to a group of higher-level cognitive abilities, such as problem solving, thinking abstractly, planning ahead and being flexible in one's thought processes (Mattson *et al*., 2001:186).

It is of the researcher's opinion that executive functioning develops during the concrete operational years of 7-12 years of age, stated in Piaget's cognitive developmental theory and as discussed in Chapter Three. The damage done in utero would affect the child's future development and impact on executive functions at a later developmental milestone.

5.2.3 DEVELOPMENTAL PROFILE OF INFANTS WITH NON-FAS

The developmental profile of infants with a Non-FAS diagnosis appears slightly different when compared to the FAS and PFAS profiles as mentioned above. At the Non-FAS assessment at 7-12 months of age (n=45) infants performed above the borderline category over all developmental subscales, with the most delayed subscale being that of Eye and Hand Coordination and Performance. The most developed subscales of infants not affected by FAS

are the Personal and Social, and Speech and Hearing scales which scored within the average developmental category.

When the Non-FAS infants received a later developmental assessment at 17-29 months of age (n=45) a marked difference in scores was visible. The Locomotor scale remained constant at a below average category, with an increase in the Eye and Hand coordination from borderline to below average. The most delayed subscale measured at 17-29 months in infants not affected by FAS was the marked decrease in the Personal and Social subscale of development, as well as the 2-category drop in development over the Speech and Hearing scale.

An interesting finding is that the most delayed subscale at 17 months, the Personal-Social subscale measuring adaptive skills of the infants ability to interact with others, may be attributed to a lack of stimulation within the home or caregivers. Interestingly the infants with FAS (Figure 4-5 Fetal Alcohol Syndrome Developmental Profile, Chapter Four) also showed delay in this subscale. These findings add to previous research conducted (Thomas *et al*., 1998:538-633; Carmichael Olsen *et al*., 1998:1998-2012) on older children with FAS, proving that FAS children have poorer socio-emotional development i.e., emotional, personality, social and moral development. Although socio-emotional developmental differs as children develop, the marked delay present in the Personal and Social subscale of the Griffiths development may prove to illustrate the potential for poor socio-emotional development.

Researchers have found that stimulation in early childhood has sustained benefits to underdeveloped children's emotional outcomes, attention and development (Walker, Chang, Powell, Simonoff & Grantham-Mcgregor, 2006:460). Weekly play sessions between mothers and children reduce psychological and social problems in later adolescence. Poor social-emotional stimulation is evident in this study, across all infants regardless of their diagnoses. Intervention programmes aimed at increasing stimulation between mothers and children in early infancy in the De Aar region of the Northern Cape may assist in reducing the number of children who are under-stimulated.

5.2.4 FASD DEVELOPMENTAL PROFILE'S AT 17-29 MONTHS

Figure 4-8 (Chapter Four) illustrates the developmental profile of infants with FAS, PFAS and Non-FAS diagnoses at 17-29 months of age. As could be expected, the infants with a FAS

diagnosis showed more delay over all developmental subscales when compared to the performance of the PFAS and Non-FAS infants.

Interestingly, the infants with PFAS performed better than the infants with Non-FAS over the first two developmental subscales: Locomotor and Personal Social. Infants diagnosed with PFAS meet up with Non-FAS infants at the third developmental subscale, Speech and Hearing and follow the Non-FAS distribution curve of performance through to the Performance scale.

The infants with Non-FAS follow a similar curve distribution when compared to the infants diagnosed with FAS performing at least 2- categories above the infants with FAS. Previous research studying alcohol exposed infants have shown that these infants display reduced ability and disturbed reflexes and motor behaviours when compared to infants with no alcohol exposure (Capute & Accardo, 1996).

5.2.5 DEVELOPMENTAL CATEGORY DELAY - 17-29 MONTHS

To ascertain which diagnosis (FAS, PFAS or Non- FAS) displayed the largest drop in developmental performance at 17-29 months of age, the mean highlighting the difference between the first assessment (7-12 months) and the second assessment (17-29) was calculated. Figure 4-8 FASD Developmental Profile's at 17-29 Months of Age (Chapter Four) illustrates that infants with a FAS diagnosis dropped an average of 6 categories over all developmental subscales at the 17-29 month assessment.

Streissguth, Barr, Martin and Herman (1980:152-164) noted that infant mental and motor development at 8 months is significantly related to maternal alcohol use during early pregnancy.

In a research study conducted by Van der Leeden and colleagues (2001:127-134) infants exposed to prenatal alcohol exposure were assessed at 3 months and 7 months of age. Their results proved that developmental delay was significantly more obvious at 7- months of age than when compared to their 3- month assessment. It is of the researcher's opinion that Van der Leedens (2001:127-134) study as well as this study add to the understanding that the gap between developmental delay widens as the infant matures through the various developmental stages.

The development of the infants with a PFAS diagnosis was most affected, with an approximate drop of 7.5 over all categories of the GMDS at 17-29 month of age.

The infants with a Non-FAS diagnosis also dropped in their developmental performance at 17-29 months of age, with a 3-category drop. These findings are similar to a study conducted on children aged between 5-16 years of age (Mattson, Riley, Gramling, Delis & Jones, 1998:146-153) where researchers were surprised to find neuropsychological deficits in children not diagnosed with Fetal Alcohol Syndrome (FAS). The neurological deficits were very similar to the FAS group in the pattern and magnitude of their deficits.

5.3 DEVELOPMENTAL SUBSCALES - A GESTALT THEORY PERSPECTIVE

As described in Chapter Three, each developmental stage is essential for the overall development of an infant. It is of the researcher's opinion that if a delay occurs in one or more of the developmental subscales, as shown previously, it would affect the emotional development of the infant and impact on the Gestalt processes of contact, awareness and self-regulation.

The **Locomotor subscale** of the Griffiths Mental Development Scale (GMDS) allows the examiner to assess an infant's gross motor skills, balance, co-ordination and control over movements (Adnams, *et al*., 2001:557-562). One of the central objectives of Gestalt therapy is to enhance a child's *awareness,* in order to promote their ability to live in the here and now (Blom, 2004:50). An infants control over their bodies gives them an opportunity to get to know their environment, take responsibility for their choices, increase their self-knowledge and acceptance and allow them to make contact.

Biological programming seems to present in the developmental phases of infants and can be understood within locomotor development. It if of the researcher's opinion that when infants present with a developmental delay in this area of development it may influence the Gestalt perspective of the way he/she perceives and makes contact with the environment. *The sense of control* associated with walking, running and jumping, to name but a few, is essential in building the infant's self-esteem and acceptance of self.

The **Personal and Social and Speech and Hearing subscales** of the Griffiths Mental Development Scale (GMDS) assess an infant's independence and ability to make contact with his/her environment (Adnams, *et al*., 2001:557-562). Although infants may seem quite unaware of their surroundings, this is incorrect. *Making contact* with the environment, another key Gestalt concept, is essential in becoming aware of both the self and the environment; seeing, hearing, smelling, tasting and touching-all of which develop rapidly during the first years of life- are the basis for experiencing the environment (Nelson & Israel, 2000:25).

The researcher is of the opinion that a developmental delay in one of these subscales may influence the way the infant makes contact with their environment. *Boundary* disturbances, Gestalt defence mechanisms, as discussed in Chapter Three may develop due to the infant's inability of making contact. These disturbances may then present as *defence mechanisms* becoming more entrenched into the infant's sense of self as development continues.

The senses are also essential in the *self-nurturing* of an individual, the need to move from external support to self-support. If developmental delay is present in these subscales the researcher believes that infants may find it difficult to nurture themselves or others, impacting on their sense of worth and relationships with other individuals.

A basic assumption of Gestalt theory is that individuals can themselves deal effectively with their life problems (Corey, 1977:72), however the question remains whether individuals who are developmentally delayed could develop the self-support needed to do so?

Goldstein (as cited in Clarkson, 1989:4) adds that no matter how damaged the organism seems, there is always a drive towards self-actualisation. It can be inferred that this too holds true for individuals diagnosed with Fetal Alcohol Spectrum Disorder (FASD).

Erik Erikson's psychosocial development theory, as described in Chapter Three, has been included to understand the foundation of personality development. Kaplan and Sadock (1997) state that during **Stage One: Basic Trust Versus Mistrust** the infant either develops basic trust or mistrust, depending on the nature of the relationship between mother and infant. This stage covers the first eighteen months of the infant's life forming the foundation for further psychological and social development (Ramokgopa, 2001: 34).

Stage One prepares the infant to cope with the challenges and demands of life. During this stage the child relies on the caregiver in developing trust towards the environment, utilising social support. A lack of care and support during this stage may lead the child to develop fear, anxiety and suspicion towards the environment, impacting on contact and satisfying of needs in later life (Ramokgopa, 2001: 35). As the child develops he/she influences the family as much as he/she is influenced by it (Maier, 1969: 27).

The infant moves through various stages of psychosocial development, by working through a conflict in each stage. The **Second Stage: Autonomy Versus Shame** spans from 18 months to 3 years of age. This stage builds upon the trust established in Stage One. During this stage the child's physical development enables him/her to experiment with the environment, allowing for the creation of a sense of independence and autonomy. The parent's role during this stage is to create some control. If no control is evident it may lead to a loss of self -esteem and lack of self-confidence (Ramokgopa, 2001: 36).

It is of the researcher's opinion that the conflict experienced at each stage may be similar to *boundary disturbances* as described in Gestalt theory. At each stage, contact needs to be made with the environment in an attempt to resolve the conflict; this in turn creates for an increased *self- awareness* and acceptance of self constantly building on the self- perception when compared to the environment.

It is necessary at this point for the researcher to add the importance of **early family attachment,** which forms a large part of the personal and social subscale. The infant depends totally upon external care and control. It is the mother or caregiver that brings the social world to him/her (Maier, 1969: 35), with physical contact in the first year between infant and adults a priority for stimulation (Mercer, 1998:285). As mentioned in the results above, most of the infants in the research study performed low on the personal and social subscale of the Griffith's developmental assessment. The researcher noted, while administering most of the developmental assessments that there was little to no positive mother to child interaction or physical contact present during the assessment.

Cultural and familial influences dominate during childhood, with early family attachments gradually developing and becoming evident at about 7-9 months of age (Nelson & Israel, 2000:29). Early attachment is considered important not only because of the immediate behaviours demonstrated by the infant but also because these behaviours have been shown to

correlate with later behaviours (Nelson & Israel, 2000:30). The high levels of depression and the overall emotional state of the mothers participating in the research study from De Aar in the Northern Cape region, impacted on their perception of self (Fourie, Rosenthal, Nero, Molteno & Viljoen, *in prep*). It is thus not unexpected that mothers living in these circumstances are not inclined to stimulate their infants, which would form strong, secure bonds seen as being central to the attachment theory as described by John Bowlby (Posada & Jacobs, 2001: 821).

It is of the researcher's opinion that the high levels of alcohol consumption in this region not only add to the increased rates of infants diagnosed with Fetal Alcohol Syndrome (FAS) but also interfere with a parent's ability to do a good job in nurturing the infant.

In the early months of a child's life, a caregiver needs to put in a great deal of energy into comforting and stimulation. The intoxicated parent is not alert and may be too numbed to notice what the infant's developmental issues are.

From the age of 2-12 months the infants greatest need is for a responsive, sensitive, interactive caregiver. Substance abuse hinders the parent's capacity for responsiveness, at a simple level such as eye contact and the exchange of smiles, essential in assisting the infant to feel loved and accepted (Mercer, 1998:97). The impact on emotional and communicative development can be severe.

The **Eye-Hand Coordination & General Performance** subscales of the Griffiths Mental Development Scale (GMDS) assess an infant's fine motor skills, manual dexterity, visual perception, manipulation and speed and precision of functioning (Adnams, *et al*., 2001:557-562). For infants to complete the tasks testing the above modalities successfully, a level of cognitive integration needs to be achieved. As discussed in Chapter Three, Piaget's cognitive theory outlines ways to conceptualise learning and cognition (Piaget, 1954).

The researcher agrees with the opinion of Piaget and sees the infant as a biological organism that adapts to his/her environment by actively organising and interpreting experiences, *assimilating* existing schemes from the environment and making them part of the self. Through assimilation, the mind of the infant develops and attains a greater understanding of the world. Through the increased awareness of the environment, an infant makes choices creating

alternatives for his/her behaviours, all the more, increasing their sense of responsibility and sense of self.

In summary, infants with Fetal Alcohol Syndrome exhibit the most marked developmental delay over all developmental subscales at both 7-12 months of age and 17-29 months of age. The infants with a Partial Fetal Alcohol Syndrome diagnosis, present with a larger delay at 17-29 months of age when compared to their performance at 7-12 months, and even infants diagnosed as Non-Fetal Alcohol Syndrome display delay over various subscales. Neurobehavioral dysfunction is therefore related to the cognitive and behavioural impairments caused by the structural and functional changes of prenatal alcohol exposure. However, development is closely associated with the cultural norms and ideas within a society.

It is of the researcher's opinion that these findings be viewed from a South African perspective. Although the GMDS has been standardised for the South African population, it is important to take into account that many infants in the De Aar community come from poor, under-stimulated families, who use alcohol excessively. Dawes and Donald (2000:8) emphasise that the majority of South African children live in chronic poverty. Relationships may be unstable, with children being exposed to alcohol abuse, domestic violence and other adverse conditions associated with unending poverty (Dunn, 2004:321)

The presence of any of these factors would impact on the development of the infant. However adding a Fetal Alcohol Syndrome diagnosis to these factors could be devastating to the development of an infant. As stated above, the researcher observed that many infants assessed for this study, regardless of their FASD diagnosis were under-stimulated. At various points during assessment the researcher asked the mothers of the infants to refrain from playing with the toys, confirming the general lack of stimulation amongst all age groups of the population. This may explain the reason the profiles across the Fetal Alcohol Syndrome, Partial Fetal Alcohol Syndrome and Non-Fetal Alcohol Syndrome infants was not significantly different. Although both the infants diagnosed with Fetal Alcohol Syndrome and Partial Fetal Alcohol Syndrome presented with signs of delay, the Non-Fetal Alcohol Syndrome displayed delayed trends as well, confirming a generally poor trend of development. The cultural contexts in which all these infants' function do not provide opportunities that enhance the development of cognitive skills (Meyer & Van Eden, 1988:89).

5.4 IMPLICATIONS

The results from this research detail a number of practical approaches for further neurodevelopmental research within similar contexts in South Africa.

Although the Griffiths Mental Development Scale (GMDS) scores have been standardised for a South African community, it is of the researcher's opinion that as a first practical approach a clear set of norms be developed for underprivileged, under stimulated, South African communities. It is clear from the findings, that infants and children in low socio-economic, under-privileged communities of South Africa do not receive appropriate stimulation and therefore impacts on their developmental scores. It may be necessary to develop a stimulation programme for communities as a whole, due to the high rate of infants with Non-FAS with poor stimulation and developmental delay.

The second practical aspect of this research is that it has shown that the GMDS scale can be used in a South African population to ascertain developmental scores of infants with FAS, PFAS and a Non-FAS diagnosis.

As discussed in Chapter One and Three, the development of the senses assists an infant in making contact with the environment, others and the self. The research study allowed the researcher to question some key aspects regarding the association between structural brain damage due to prenatal alcohol exposure and sensory integration:

1) Can infants diagnosed with FASD make sense of what they hear?
2) How do they experience the world-through their senses-balance, body space and touch?
3) What level of listening are they capable of?
4) Could they think silently or would everything be expressed?
5) What reflexes do they have? Do they understand sequencing, time and organisation?
6) What happens when sounds and visual elements are mixed together?
7) Are they aware of their bodies? How do they breathe?
8) Could they make mental pictures?

This research has not only contributed to the fields of neurodevelopment, but also highlighted the necessity to embrace FAS in future research projects. This is particularly relevant for the South African context, with the highest reported rates of FAS in the world.

5.5 LIMITATIONS

The following limitations were identified from the research study:

- Although the results from this study may be indicative of FAS in similar communities, the results must be used with caution when assigning to other populations within different contexts
- The sample would have been more significant had it been larger. The inclusion of all categories of the Fetal Alcohol Spectrum Disorder (FASD) would of allowed for a more comprehensive analysis
- Poor stimulation of children in the De Aar community accounted for the lower developmental subscales across all categories of the FASD diagnosis
- Infants mortality or moving out of De Aar confounded the numbers of the infants assessed during the retrospective study, from where the data was obtained
- Extraneous variables such as, being hungry, sick, tired or cold may have influenced the infants' developmental performance on the GMDS. Factors such as malnourishment and low birth weight, as well as the effects thereof on poor performance of cognitive development were taken into account.

Despite the presence of these uncontrollable variables, they did not diminish the ability to distinguish a profile between FAS, PFAS and Non-FAS infants, as all participants were in a similar position.

5.6 RECOMMENDATIONS

Arising from this study, the researcher identified the following recommendations for further research in the field of Fetal Alcohol Syndrome:

- Gestalt Play Therapy would be beneficial when working with children with a FASD diagnosis. There needs to be an awareness of both the self and environment that is formed, impacting on the child's sense of responsibility for their actions.
- The developmental norms should be standardised and compared to other South African communities within a rural region.
- The reason for the lack of stimulation, between the mother and infant in similar communities and the impact on attachment.
- The relationship between low birth weight, small head circumference and developmental delay

- The development of a behavioural profile assigned to infants and/or children with a FASD diagnosis

5.7 CONCLUSION

From this study it can be concluded that there is a definite neurodevelopmental profile for infants diagnosed with FAS, PFAS or Non-FAS. The delay in development at 17-29 months of age compared to 7-12 months of age illustrates that all infants follow a pattern of development from birth to approximately 17 months of age. Development canalises as an infant grows. Over a period of time the infant with a developmental delay will be unable to narrow the obvious gap of development, when compared to infants with a normal development.

Unless this developmental delay is identified early and appropriate intervention is introduced, the chance of an infant's development catching up is unlikely. Previous research proved that specific brain regions are implicated due to prenatal alcohol exposure, and affects the development of infants as well as cognitive behavioural aspects of children and adults.

The need for caregivers to identify developmental delay early may greatly influence the overall development of these infants and allow them to integrate effectively in a South African community.

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7 APPENDICES

7.1 APPENDIX 1 - ETHICS COMMITTEE OF THE UNIVERSITY OF WITWATERSRAND LETTER OF APPROVAL

7.2 APPENDIX 2 - CLEARANCE CERTIFICATE ISSUED FROM THE DEPARTMENT OF HEALTH IN NORTHERN CAPE

7.3 APPENDIX 3 - PARENTAL INFORMATION SHEET, CONSENT FORM AND NEURODEVELOPMENTAL ASSESSMENT RECORD BOOK