THE DEVELOPMENT AND EVALUATION OF A PROGRAM OF STIMULATION FOR PRESCHOOL CHILDREN WITH DELAYED MOTOR OR LANGUAGE DEVELOPMENT

by

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SUMMARY

The major objective of this study was to develop and to investigate the merit of a stimulation programme for improving the abilities of preschool children with delayed fine-motor and/or language development.

There are many different kinds of programmes available for stimulating the abilities of preschool children. Teachers, home-schoolers and mothers utilise these to supplement the preschool curriculum for their preschool children. It is believed that children with developmental delays are at risk for formal education and that stimulation can offset these delays ensuring that children are able to actualise their potential. An intervention programme was designed with the aim of improving school readiness abilities in children. Although many research studies support educational stimulation, to date, insufficient attention has been paid to researching stimulation programmes of this kind.

Subtests from Sonnekus and Le Roux's Group Test for the Evaluation of School Readiness were selected for the screening test. Subtests were selected to identify children with fine-motor and/or language delays. Two hundred and twenty-five children of five years of age turning six years during the course of the year were screen-tested at four different schools. Forty-three children achieving the lowest scores on the screening test at two of the most homogeneous schools in terms of socio-economic grouping were allocated to the experimental or control groups of the Pretest-Posttest Control Group design. The experimental group consisted of 21 participants and the control group, of 22 participants. Quantitative analysis involved determining statistically significant differences between pre-intervention and post-intervention test scores on the six subscales of the Revised Griffiths Scales of Mental Development and the Draw-a-Person test for the two groups of preschool children identified as fine-motor and/or language delayed. The effect of the intervention was also examined on male and female children separately. The male to female ratios were: Group 1: 15:6 and Group 2: 14:8. Overall, the gender ratio was 67,4 % male to 32,6 % female.

The programme of stimulation includes vocabulary and language, eye and hand co-ordination, visual and auditory perceptual training, numerical and alphabetical stimulation, and reasoning skills. It was designed for implementation over 20 sessions, each of an hour in duration. The programme was completed in a school term, three sessions per school week for six weeks and two in the seventh week.

The intervention programme was effective in improving certain school readiness abilities of children with delays in language and/or fine-motor co-ordination. The following statistically significant results were obtained:

With regard to all the children exposed to the intervention programme, improved scores were obtained on the Personal-Social and Eye-Hand Co-ordination subscales of the Griffiths Scales and the Draw-a-Person test for the children. Negative scores were obtained on the Locomotor Scale. For male children, the intervention programme improved the scores on the Speech and Hearing and Eye and Hand Co-ordination subscales of the Griffiths Scales and Draw-a-Person test. Regarding female children, the intervention programme improved the scores on the Eye and Hand Co-ordination subscale of the Griffiths Scales and the Draw-a-Person test. Negative results were obtained on the

Locomotor subscale for female children. The gender differences obtained confirm that differences exist between the genders at this stage of development.

Consistent positive results were obtained on the Eye and Hand Co-ordination subscale of the Griffiths Scales and the Draw-a-Person test. The Eye and Hand Co-ordination subscale is a measure of visual-motor co-ordination. The Draw-a-Person test reveals the progression in intellectual development toward greater conceptual complexity and maturity. The intervention programme thus contributed to the school readiness abilities of the children.

Generalisation of findings is limited for two main reasons. Original settings can never be replicated in educational research and extraneous variables (some measureable and some unknown) may have influenced outcomes.

The study was finally evaluated using Payne's (1994) model of programme evaluation and the Program Evaluation Standards (Sanders, 1994). Regarding Payne's (1994) model of programme evaluation which involved an evaluation of the research design, data collection, data analysis, results and cost effectiveness, the study can be judged positively. A single negative aspect was the lack of pilot testing which would have served the researcher better in planning for more effective implementation. Positive affirmation for the study was further obtained in applying the Program Evaluation Standards (Sanders, 1994) of Utility, Feasibility, Propriety and Accuracy.

This study endorses the belief that preschool development is best promoted by varied educational stimulation within a recognised preschool programme guided by qualified teachers. It is hoped that the development, quantitative analysis and assessment of this intervention programme has contributed to this most important field of preschool intervention and will serve to encourage further research in this area.

CHAPTER ONE

ORIENTATION, MOTIVATION AND AIMS

1.1 ORIENTATION AND RESEARCH PROBLEM

This study aims to evaluate the effectiveness of a programme of stimulation on children with delayed fine-motor and/or language development. Attention has been paid to these aspects of child development in the past but more pressing issues such as over-population, unemployment and poverty, to name a few, in the last decade have relegated the issue of preschool education to a position of lesser importance. Although there is a demand for preschool education, the public education system in South Africa and many other countries is not in a position to subsidise preschool education. This sector is chiefly privatised or run by Non-Governmental Organisations (NGOs) where few regulations govern the education of young children, to the extent that many nursery schools do not even employ qualified nursery school teachers.

Two major but conflicting points emerged in a report of a South African study on early childhood development confirming the demand but lack of official support for preschool education. The first concern centred on parents' growing needs for out-of-home care for their preschoolers and the second, recognition of the role of quality education as a foundation for later adult performance. In 1994 it was recommended that a reception year for five year olds within a broader system of childcare be created (Padayachie et al., 1994). That this recommendation has not been implemented confirms the earlier point made on the relegation of preschool education as an issue of lesser importance.

The importance of early childhood development was re-iterated in the report of the National Commission on Special Needs in Education and Training and the National Committee on Education Support Services. Better co-ordination between bodies providing childcare was proposed. It was suggested that the Education Department take greater responsibility for the three to five year old learners and that a register for at risk children be established and help and support be made available for parents at local centres. The term "learners with special education needs" was recommended to be substituted by "learners who experience barriers to learning and development" (Department of Education, 1997). Clearly there is a discrepancy between well-intentioned policy-making on the one hand and reality, on the other.

The same issues are voiced internationally. Expression of a greater need of parents for out-of-home care for their children and that quality preschool education should serve as a foundation for further learning were pinpointed in the International Association for the Evaluation of Educational Achievement (IEA) Preprimary Project across 11 countries (Weikart, 1995).

Isenberg and Brown (1997) reported on a 1995 assessment of 400 childcare centres in the United States of America (USA), where there are five million children in childcare. Only one in seven centres was rated as good based on criteria of the National Association of Education for Young Children. Although quality control does not receive much attention as yet, at least funding for early childhood education continues to increase annually and remains a national priority (Washington & Bailey, 1995). Momentum continues with the

first national education goal in the USA that states that all children will start school ready to learn (Pyle, 2002).

Formal school enrolment in South Africa is mandatory for all children of six years turning seven years in their first year of schooling. This regulation was based on the fact that most children of this age are ready for formal education. A constitutional court ruling in 2003 stated that children of five years turning six years before 30 June may be enrolled in formal schooling if they are ready to go to school. It is noteworthy that the constitutional court ruling was based on consultation with educationalists regarding school readiness (Department of Education, 2004).

Many children are handicapped when they enter school because they have not had the chance to develop the skills, habits, and attitudes expected of children in the first grade. Until preschool education is viewed as a priority, children with language or motor developmental delays or those from disadvantaged backgrounds, will not receive the attention they deserve. These children are often retained, placed in special education, drop out of high school, or lose confidence, all unnecessarily (Weikart, 1989).

Locally, the development of the young child receives minimal attention until the education system meets the child. Although the public health clinic system provides for the identification of at risk infants and young children, this does not happen due to the chronic shortage of staff with huge demands on their services. Many grade one teachers have reported that developmental delays are not being identified and preschool children are not receiving the help they need in order to be ready for school. This was reported by Cloete and Kok (1988) as the reason for their research in the field of remedial education.

Children's needs do not change according to prevailing social-political systems. Economic policy affects whether women are encouraged to join the labour force or stay at home and care for their children. Social policy directs the attitude towards the liberation of women. How children's needs are met should not be determined by the social-political systems and available resources, but by children's needs alone (Arango & Nimnicht, 1987).

Golden years are being lost and the chances of recovery reduced without the availability of professional intervention. The earlier the remediation of delayed development begins, the greater the success in overcoming the difficulty. Ultimately, this adds up to fewer demands on the educational system, and the community. Further motivation for special assistance is that the state benefits in the long-term when early intervention ameliorates the problems of at risk children (McCormick & Hickson, 1996).

1.2 MOTIVATION

The South African Schools Act (1996) stipulates that all children, including those with special needs, are entitled to education. Because of the shortage of healthcare services and the inadequate regulation of preschool education, children with delayed development are not being identified and receiving the assistance they need. Although exact statistics are not known, Donald, Lazarus and Lolwana (2002) report that the combined effects of malnutrition, poverty, and diseases such as Aids, have cereated a much higher proportion of children with disabilities and difficulties in South Africa than in more advantaged countries.

Almost 17% of the total population of 6,39 million children are under the age of six years and the majority of these children are underprivileged according to Luiz (1999). Poverty and poor living conditions render these children to be classified as at risk.

The children who do receive help are generally from a middle to higher socio-economic level whose parents are members of a medical scheme which enables limited funding for the professional care the child requires. These parents consult paediatricians, neurologists, psychologists, physiotherapists, speech and language, and occupational therapists. With the onset of medical schemes changing to managed healthcare organisations, the professional intervention for these children has been further restricted.

Thus fewer children are able to receive help from professionals such as occupational and speech therapists. Preschool teachers, some of whom are not qualified, are not trained to treat children with delayed development. Training is focussed on the development of abilities in normal children according to a preschool programme. There are numerous preschool programmes available, one, for example, is the Montessori (1964) preschool programme. Many of these programmes do not specifically address delayed development, aimed at remediating the difficulty so as to improve the school readiness of the child, but aim at improving school readiness in general.

Locally, the following researchers have shown that their programmes are able to deliver significant results. Grobler (1993) evaluated a home-based, parent-orientated preschool programme qualitatively. Parents expressed positive opinions regarding the programme. Some programmes specifically aimed at improving developmental delays have shown positive results. Kay (1979) confirmed the efficacy of a motor programme on the scholastic progress of learning disabled primary school children. Houston-McMillan (1988) showed a gain in Griffith Scales scores in a group of mentally handicapped children after an intensive programme of stimulation. Positive results were obtained by Behr (1997) for a programme in which parents and teachers were trained in physiotherapy activities aimed at improving the functional abilities of the children. Briedenhann (1998) reported that five out of 11 children showed an improvement in gross-motor skills after an intervention programme. Cloete and Kok's (1988) varied programme of stimulation produced positive results in visual-motor perceptual ability in grade one children where learning difficulties had already manifested. Herbst (1989) found that environmentally-disadvantaged children who were stimulated improved their levels of school readiness.

Although positive findings were reported in the above studies, none of the programmes was specifically designed to improve the abilities of preschool children with delayed development in language and/or fine-motor co-ordination. As many children are at risk for grade one, it was decided to develop a stimulation programme to test whether such a programme can play a role in improving the school readiness levels of children with difficulties. Further use for it may be its incorporation into the normal curriculum followed in a preschool or used as an additional teaching material in a home-schooling environment, as these programmes are often used. If proven to be successful, the programme will be made available to the public for general use to assist in the stimulation of all children to improve their abilities.

Given the above motivation and drawing on knowledge of child development, the concept of school readiness and junior primary education, a stimulation programme was designed with a view to improve the ability levels in preschool children with developmental delays. The programme encompasses vocabulary and language, eye and hand co-ordination, visual and auditory perceptual training, numerical and alphabetical stimulation, and reasoning skills.

The research question that follows from the above is:

Will a stimulation programme which encompasses the above foci be successful in enhancing the school readiness of children of five to six years of age who show language and/or fine-motor delays?

The substantive hypothesis is that there will be a significant improvement in the Griffiths Scales and Draw-a-Person scores of children with language and/or fine-motor delays between pre- and post-testing after a programme of intervention.

1.3 AIMS OF THE STUDY

The first aim of the study was the development of the programme of intervention.

The specific operationalised aim of the study is to ascertain:

- if there are statistically significant differences
- between pre-intervention and post-intervention test scores;
- on the scores of the six subscales of the Griffiths Scales of Mental Development (Luiz, Barnard, Collier, Kotras & Stewart, 2000b) and the Draw-a-Person (Harris, 1963)
- for a group (N=21) of preschool children (of five to six years of age) of mixed gender
- who are fine-motor and/or language delayed as measured by selected subtests from the Group Test for the Evaluation of School Readiness (Sonnekus & Le Roux, 1995b)
- who had participated in a stimulation programme as described above and detailed in chapter 4
- as compared to a control group of equally language and/or fine-motor delayed children (N=22) of similar age and gender distribution who had not participated in the stimulation programme,
- utilising a Pretest-Posttest Control Group design.

The control group will receive the stimulation programme after completion of the post-intervention testing.

The study furthermore aims to ascertain whether the separate genders show different levels of improvement in different categories utilizing the same design and measures as above.

The final aim of the study is an objective evaluation of the programme of intervention from both Payne's (1994) and the Joint Committee on Standards for Educational Evaluation (Sanders, 1994) programme evaluation models.
Secondary aims are:

- stimulation of interest in preschool education in the community by giving talks
- involving the parents of the children in their child's education by sending home reports detailing their child's level of school readiness in the form of a Griffiths Scales assessment report after the evaluations are complete
- being a support to the teachers of these children
- and disseminating the results of the study to scientific journals and at congresses nationally and internationally.

1.4 CHAPTER DELINEATION

The introductory chapter highlights the rationale for the investigation. That children with delayed development do not receive remediation to improve levels of their school readiness, places them at risk for formal schooling. A programme of stimulation was developed to test whether the school readiness levels of preschool children would improve.

In order for a programme to be developed, aspects of child development, school readiness, and multidisciplinary interventions that are currently available to children with delayed development need to be reviewed. The background on which the programme is based is to be found in chapters two and three.

The second chapter deals with a review of research literature on child development and developmental delays. Normal child developmental milestones are discussed from the neural, cognitive, language and motor perspectives. The concept of school readiness is outlined. A definition is given and the etiology of developmental delays is described as this study focusses on children with delayed development who were selected for the study in which the stimulation programme was researched.

Educational, medical, speech and occupational therapy, physiotherapy and psychological interventions are examined in chapter three. Interventions from all the disciplines are outlined as these are used to improve abilities in children with educational difficulties and developmental delays. All these interventions need to be taken cognisance of in the design of a programme of stimulation.

The empirical investigation is discussed in chapter four. The research problem, motivation for the study, goals of the research and the method will introduce the discussion on the empirical investigation. Regarding the method, the research design, the selection of the participants, measuring instruments, the stimulation programme and the procedure followed will be described. The research design utilised a Pretest-Posttest Control Group design to put the stimulation programme to scientific scrutiny. The hypotheses of the study and how the data will be statistically analysed will conclude the chapter.

Results of the study are presented in the fifth chapter.

Chapter six concludes the study by discussing and integrating the quantitative results of the study and includes a discussion from a programme evaluation perspective. The limitations and recommendations of the study follow an objective discussion of the results.

CHAPTER TWO

CHILD DEVELOPMENT AND DEVELOPMENTAL DELAYS

To develop and evaluate whether a stimulation programme can improve the abilities of preschool children with developmental delays, the development of the child needs to be reviewed.

The classical developmental psychologist Illingworth (1980) maintains that all professionals involved in the care of children need to be familiar with what is regarded as normal and variations from the norm in order to diagnose the abnormal. It is for this reason that theories of normal development and developmental delays will be described in this chapter. As this study aims to develop and evaluate the effectiveness of an intervention programme on children with delays, these aspects need to be explored.

Firstly, theories of development will be discussed in this chapter. Theories of development determine how one views the developing child. One can view development from a passive maturational or from a dynamic perspective where the environment influences the child. This directly determines broad educational policy, and how one regards a developmental delay. Secondly, normal developmental milestones will be reviewed. Normal neural, cognitive, language and motor development will be concentrated on. The concept of school readiness will be explored. A definition of a developmental delay will introduce the third section on developmental delays, followed by a discussion on the etiology of developmental delays as delays may be congenital, preventable or ameliorable. The chapter concludes with a brief summary.

2.1 THEORIES OF DEVELOPMENT

Theories of development are reviewed in this section. One's perspective of child development directly affects how one views normal or delayed development in a child.

Human development encompasses the gradual growth of the child towards adulthood. Two main learning theories determine how one views this process. The first theory has its roots in the historical view that development occurs due to passive maturation (Gardner, 1982), and the other more contemporary approach, that it results from dynamic interaction with the environment (Bronfenbremmer, 1979). A developmental delay may be regarded as a maturational lag from the first perspective. The second theory evolved from the connectionist (or behaviourist) and associative traditions. Behaviouristic theory is based on learning which occurs due to a stimulus giving rise to a response (Skinner, 1974). In terms of intellectual learning the stimulus may be visual, auditory, tactile or kinaesthetic and the response, motor. The associative theory (of whom a leading proponent was Piaget (1963)) assumes a hierarchy from concrete to abstract thinking. Delayed development in this case may have been caused by faulty learning during an earlier stage which has laid an inadequate foundation for later more complex learning (Williams, 1999).

The first approach thus regards a developmental delay as below average development which can be outgrown (Gardner, 1982). The second contrasting view suggests that the

quality of interaction with the environment can reduce the effects of the delay in the child (Bronfenbremmer, 1979).

Piaget (Furth, 1981; Piaget, 1963) proposed that children use assimilation and accommodation to form and extend the structures of their minds. In assimilation children match concepts arising from interaction in their environment with previously formed mental structures. Accommodation entails the modification of the existing knowledge to make sense of the new. As children proceed through the four periods of intellectual development (sensorimotor, pre-operational, concrete operational and formal operational), play is the medium though which the processes of assimilation and accommodation occur (Piaget, 1963; Williams, 1999).

Both Athey (1990) and Piaget (1963) proposed that the early schemas of babies form the basis of patterns of behaviour which children between the ages of two and five years establish. These become foundations for later learning. Athey (1990) defines a schema as "a pattern of repeatable behaviour into which experiences are assimilated and that are gradually co-ordinated" (p. 37). In the Froebel Early Education Project Athey (1990) identified a number of schemas.

Athey (1990) elaborated on Piaget's (1963) work and named these schemas according to their characteristics. For example, the vertical schema relates to any up-and-down movement represented in the behaviour of children. Other schemas named are dynamic vertical, dynamic back and forth or side to side, dynamic circular, going over and under, going round a boundary, enveloping and containing space, and going through a boundary. These patterns are represented in children's play, thinking, drawings and language. Cognitive development can be stimulated by providing opportunities for children to investigate and expand the schemas they are learning about (Athey, 1990). As children develop, single schemas become combined into more complex actions, although earlier schemas can be revisited (Athey, 1990).

Although many modern developmentalists, for example Bronfenbremmer (1979), do not subscribe to the associative theory, no one has introduced evidence that re-orders the sequence of substages as children develop (Gardner, 1982). It is not that they dispute Piaget's (1963) contribution, they feel it is not sufficiently comprehensive to explain child development. Bronfenbremmer (1979) focusses on the interconnectedness of all the people and contexts across time in the child's world. Hodapp (1998) fuses the maturational, behaviourist and Piagetian (1963) perspectives and views an active developing child within an active developing environment. A related perspective is transactional developmental theory (Sameroff, 1975). This interactional theory stresses the impact of children's developmental contexts which are mapped onto their emerging psychological capacities at different points in the life cycle. According to this approach, family, neighbourhood, school and peers, influence the different stages of development in different ways.

Wiliams (1999) provides a meta-theoretical perspective on child development subscribed to in this study. He views a developing child interacting with and responding to a dynamic environment. This approach reflects contemporary thinking and current Western educational policy (Williams, 1999).

Although history has presented diverse theories of child development, this current view in childhood education is reflected in the position statement on developmentally appropriate practice (DAP) of the National Association for the Education of Young Children in the USA (Goffin, Wilson, Hill & McAninch, 1997).

This document describes DAP classrooms as interactive. In harmony with contemporary thinking, learning is child-centred, experience-centred and process-oriented. Projects or thematic units allow learning across all content areas. Through practical experience concepts are introduced and content built across all domains (Raines, 1997).

Most preschool programmes operate from the basis of these principles. Flexibility exists in terms of academic instruction. The constructivist approach encourages learning through play and creative activities and the instructivist, through teacher-directed activities. These different approaches reflect basic contrasting notions of child development (Katz, 1999b).

These approaches are represented in preschool programmes solely or in combination. By nature of the fact that the programme designed for this study is a stimulation programme, it reflects instructivist thinking.

Normal developmental milestones are covered in the next section.

2.2 NORMAL DEVELOPMENTAL MILESTONES

Normal development is a continuous process from conception to maturity. The sequence is the same in all children, but not the rate (Piaget, 1963). There is a sequence of development within each developmental field, but the development in one field may not run parallel with that in another for example, gross-motor development may be faster than expressive language ability. Development is related to the development of the nervous system (Harris, 1998a).

This section is introduced by a discussion on the role of gender in development. Normal development is then explored from a neural, cognitive, speech and motor perspective.

2.2.1 The role of gender in development

The role of gender is important as gender differentiation has predictive value in development. There are three approaches to the role gender plays in a child's development namely the biological, the sociological and the constructivist approaches.

Gardner (1982) believes that from the moment of conception when the sex of the child is determined, biological development is pre-ordained. After birth sexual characteristics, for example the greater proportion of muscle tissue in males, the greater amount of fat and the more rapidly maturing bones of girls continue according to the sex of the child. Consequent development is influenced neurally, cognitively and socially (Gardner, 1982; Liben & Bigler, 2002). For example there is a higher incidence of learning difficulties in the male than female population (Kolb &Whishaw, 2003).
Evolutionary psychology contributes the idea of survival of the species as some traits were re-inforced over millenia to produce for example, strong spatial skills in men as they performed the role of hunters (Liben & Bigler, 2002).

Beckett (2002) emphasises the sociological perspective. Gender roles are socially constructed. They are created by the particular circumstances in a particular society usually to serve the interests of that society. From a psychological perspective they are learnt behaviours. Learning theory provides the basis for this learning. In the West girls and boys are exposed to different learning environments, for example different toys and colours are encouraged and gender inappropriate activities are discouraged. The different social stereotypes of male and female develop according to nature and nurture through verbal and non-verbal communication (Beckett, 2002; Wood, 1997).

Wood (1997) points out how arbitrary the meanings of gender are by sharing examples of how different cultures view masculinity and femininity. In some cultures women and men are socialised to be aggressive, independent and competitive. In others, a person's gender is changeable and multiple genders are highly regarded. Over time, meanings of gender can vary.

In respect of the sociological perspective, Liben, Bigler and Krogh (2002) add that language usage and media portrayals influence children's beliefs about sex-differentiated occupations. This was confirmed in Powell and Abels's (2002) study which showed that children are influenced by stereotypes in TV programmes. Their sample included an equal number of boys and girls from seven to twelve years of age. They found that half of the girls and all of the boys identified with characters of their own gender. The reason why only half the girls identified with characters of their gender was not accounted for but the researchers queried whether the fact that most characters presented were males in active roles while the females were presented in passive roles may have influenced findings. They criticised the media as stereotypes influence the gender development of children and made recommendations that characters in children's TV programmes represent both genders equally.

Constructivist theories reject the position that children receive and act upon the biological and sociological influences. They believe that children are active in restructuring these influences. Children perceive gender in two ways. Firstly, they have a dichotomous view of what characterises the different genders and secondly, they have their own perspective of what they believe is appropriate for their own gender and how this influences what they regard as appropriate for the other gender (Bussey & Bandura, 1999). Liben and Bigler's (2002) research contributes to this position by demonstrating that these self-relevant behaviours play a causal role in the shaping of cognitions about others and vice versa.

By the age of three years a child develops the understanding that gender is unchanging, that being male or female is a fixed aspect of their identity (Wood, 1997).

Although the above described constructivist theory on the role of gender in child development is not denied, the biological and sociological perspectives are viewed as playing a fundamental role in the establishment of gender identity in the young child. The active process of analysis and response held by the constructivist position plays a role in later development of gender identity. As this study concerns the development of preschool children, the role of the biological and sociological perspectives are regarded as more significant at this stage.

The process of neural development is traced in the next section.

2.2.2 Neural development

The normal development of the nervous system occurs at different rates for different structures at different stages. Periods of growth occur, as do periods of inactivity. The sequence of development is consistent although some variation in the pattern can occur. Deviations in brain development, due to genetic or environmental processes, influence brain functioning (Harris, 1998a; Risser & Edgell, 1988).

Two main processes characterise the development of the brain in the first 18 weeks of pregnancy, namely neurogenesis and histogenesis. Neurogenesis refers to the growth of neurons and histogenesis, to the organisation of the neurons into different sections of the nervous system. The process of histogenesis appears related to the stage of pregnancy (Franzen & Berg, 1998).

Initial cells are non-differentiated. By the third week of pregnancy differentiation causes certain cells to form a neural tube which later become the ventricles. Three ventricles start to form by the end of the fourth week of pregnancy. The mesencephalic vesicle eventually develops into the midbrain. The rhombencephalic vesicle becomes the hindbrain and the prosencephalic, the forebrain. At the same time the neural tube closes anteriorly and posteriorly. The neural tube folds with the top bend adapting to the varying cortical structures. The other tissue in the neural tube is the forerunner of the spinal column (Harris, 1998a).

The first month of pregnancy (when many women do not know they are pregnant) is regarded as the most risky to the developing foetus with regard to exposure to deleterious substances (Harris, 1998a).

The neural tube oversees the correct positioning of the brain in that similar cells from different places end up together. The lining of the ventricular cavities generates early nerve cells which migrate to their eventual position in the brain. Migration takes place from the inside to the outside. The earliest migrating cells form the sixth, deepest layer. The following migrations are deposited around the previous layer. After placement differential growth occurs. Axons and dendrites develop to links cells together in a genetically pre-determined pattern. Basic immature cells acquire adult size and complexity. Inner and outer layers develop at different rates causing the formation of convolutions and sulci in the brain (Franzen & Berg, 1998).

Nine weeks after conception the collection of cells starts to look like a foetus. At this stage, the ratio of head to body size is half. This relationship changes through the pregnancy as the body grows to where the ratio of head to body is a third at delivery. By the twentieth week of pregnancy almost all nerve cells have been produced and by thirty weeks the total number of neurons equals the adult total. The weight of the brain increases by the growth of glial cells (Franzen & Berg, 1998).

After birth the brain remains vulnerable to genetic or environmental influences. Between birth and adolescence, the head circumference will double. The most rapid phase of growth is in the first year of life. This measurement is regarded by paediatricians as an

indication of normal brain development. Increase in size is due to a decrease in cellular density, an increase in cell size and myelination, and not an increase in cell number. The dendrites lengthen and connections between neurons increase. Myelination is the process by which the axons become insulated with a covering of lipid structures called the myelin sheath. This prevents interference from the electrochemical and electromagnetic activity of surrounding neurons and contributes to faster neurotransmission. The brain stem and highest parts of the spinal column become myelinated first. Myelination of the cortical centres for motor control of the lower extremities and trunk muscles follow (Franzen & Berg, 1998).

Luria (1976) has proposed five stages in neuro-cognitive development. The first stage is the development of the reticular activating system.

The second stage of neuro-cognition occurs when the primary areas in the temporal, occipital and parietal lobes which receive auditory, visual and somaesthetic information from the environment begin to operate. Luria (1976) determined that this stage takes place at the end of the first year of life (Risser & Egdell, 1988).

Between two and four years of age brain weight increases due to the myelination of the nerve cells associated with cognitive skills and the commissural fibres (Franzen & Berg, 1998).

Secondary areas which are modality-specific are thought to be operational by five years of age (Risser & Egdell, 1988). This stage (Luria's (1976) third stage) moves the toddler into the preschool years (Horton, 1994).

The later stages of cortical development consist of the thickening of the cortical layers, separation of the cortical lobes, and changes in the electrophysiological activity. Delta wave electroencephalograms (EEGs) change to alpha wave activity at about six years of age (Franzen & Berg, 1998).

The fourth stage of development in the brain according to Luria (1976) involves the maturation of the tertiary zones between the ages of five and eight years. The function of the tertiary zones is the integration of information from the secondary areas into meaningful cognitive data. Cortical and subcortical links control the executive, intentional and conative aspects of functioning across all modalities (Horton, 1994; Risser & Egdell, 1988).

Lesions in this area prevent the ability to process cross-modal information required in scholastic work. Maturation of this area at puberty coincides with Piaget's (1963) cognitive stage of formal operations (Morgan, 1988).

The fifth stage of development as conceptualised by Luria (1976) concerns the maturation of the prefrontal lobes. The prefrontal area assists in planning, execution of plans, evaluation of complex human behaviour, critical judgment and concept formation.

The prefrontal lobes exert control over the arousal system and regulate attention. A hyperactive preschool child may mature into an adolescent with better concentration when the matured frontal tertiary zone inhibits subcortical distractions (Morgan, 1988).

Michaud (1995) has warned that cerebral water content, extent of myelination, degree of brain development, stage in localisation of function and neurochemical content vary in children. Each of these factors influences the plasticity and potential ability for recovery of the brain.

The physical development of the brain forms the basis for the development of mental capacity. Cognitive development is discussed in the next section.

2.2.3 Cognitive development

In this section different perspectives to cognitive development such as the role learning theory plays and how mediation encourages learning are explored. A review of the stages in the development of thinking is followed by a discussion of the roles that parents and gender play in the cognitive development of children. This section concludes with a discussion on the assessment of cognitive development of a developing child.

2.2.3.1 Different perspectives to cognitive development

Different views exist on cognitive development. Skinner's (1974) view that knowledge is accumulated through the process of the conditioned response, and Piaget's (Furth, 1981; Piaget, 1963) notion that thinking capacity develops unaided through a series of stages in an invariant sequence, and Vygotsky's (1978) theory of mediation do not account for the fact that some children do not make the same desired progress as others. Vygotsky (1978) maintains that humans have certain biologically based information-processing abilities (for example attention and memory), and that all higher mental processes are socially constructed and mediated (through objects, people or language). Children learn by internalising and transforming ways of operating mentally from social interaction with more competent persons. Language is used to facilitate thinking. The zone of proximal development is the level of functioning of which a child is capable when collaborating with a mediator. Both Vygotsky (1978) and Feuerstein (1980) maintain that cognitive ability cannot develop in a child in the absence of mediation or where some condition in the child renders it unable to be used (Green, 1996).

Piagetian (1963) theory in the form of testing Piagetian tasks with children was conducted by Donaldson (1978). Her conclusions question the Piagetian view of children's cognitive development. She found that children were competent in solving the Piagetian tasks when they could relate to them and where they understood exactly what the goal was. She encourages teachers not to underestimate the rational powers of children and rather challenge disembedded thinking which is more akin to formal learning. She suggests that teachers should use the symbolic system of language to express abstract thinking within learning contexts meaningful to the child.

Bruner's (1966) classical text on the theory of instruction reflected contemporary views in his day. Curtis (1986) concurs with Bruner (1966) as to how teachers can promote intellectual development in children. They view learning as purposeful and identified three modes of representation (ways to learn). Curtis (1986) named the three modes as enactive, iconic and symbolic. Enactive refers to active motor responses which assist in learning (knowing something through doing it). The next mode is iconic where children replace action with an image or spatial scheme. The final stage is the symbolic strategy where

learning is based on language and symbols. Teachers provide the "scaffolding," which is the same concept as Vygotsky's (1978) and Feuerstein's (1980) mediation, to enable learning.

As indicated before, Athey (1990) explains that children have the ability to organise their learning experiences into schemas. Schemas are patterns of repeatable and generalisable actions which can be applied to objects or events. Play involves these recurring patterns of behaviour which, when connected, further learning. Preschool educators continue to emphasise the value of play as learning through first hand experience.

According to Sylva, Roy and Painter (1980) and Byrne, Deerr and Kropp (2003) play promotes intellectual development where tasks challenge the children for instance in music, construction, art, structured materials, manipulation and pretend activities and games.

Meadows and Cashdan (1988) point out that if children are helped to gain insights into how they think, plan, remember and solve different problems they gain confidence in tackling new tasks. Not unlike Vygotsky (1978) and Feuerstein (1980), Meadows and Cashdan (1988) believe adults should provide role models by mediating their own planning strategies for task completion and systematic ways of problem solution. Our current outcomes-based education sytem in SA sanctions mediated learning (Donald, Lazarus & Lolwana, 2002).

Feuerstein's (1980) model of cognitive functioning consists of input, elaboration and output phases, each of which requires certain cognitive functions. These include planning, attending, comparing, classifying and selecting (Feuerstein, 1980; Green, 1996).

Gardner (1983) has identified distinct "multiple intelligences." He puts forward the theory that human beings get to know their world in seven different ways. The seven human intelligences include language, logical-mathematical analysis, spatial representation, musical thinking, the use of the body to solve problems or to make things, an understanding of other individuals, and an understanding of ourselves. Individuals differ in their profile of these intelligences, and the different ways these are used in learning. Gardner (1991) maintains that children cannot be taught in the same way. The current educational system is biased towards a language-based and to a lesser extent logical-quantitative-based way of instruction and assessment. He proposes that children would learn better if learning could be presented and assessed in a number of different ways.

The Piagetian (1963) idea of cross-domain similarity which implies that all children of the same mental age perform at the same level on any task has not found wide support. Hodapp (1998), for example, reports that a child with excellent language skills may perform below average on visuo-spatial tasks.

Fodor (1983) presents a different perspective to Piaget (1963) which explains cross-domain differences in child performance. He categorises different fields for example, language as a specific "modular" system. Although some skills remain disconnected, other abilities are connected for example, vocabulary and pragmatics, and correlate with the overall mental age of the particular child.

The above theorists and Gardner (1991), for example subscribe to a constructivist perspective to cognitive development. This thinking developed in opposition to the pre-dated positivist and reductionistic perspective. Positivist thinking discovers the truth by using the scientific method. Reductionism reduces the context to its parts and emphasises these above the whole. Constructivism regards human beings as both being shaped by their contexts and being actively involved in their own development. Constructivism encourages active, socially-constructed learning within a dynamic environment in which teachers are encouraged to motivate and develop the children. These principles are congruent with outcomes-based education which is the model on which the educational system in South Africa is built (Donald, Lazarus & Lolwana, 2002).

The gradual development of thinking is traced in the next section.

2.2.3.2 Stages in the development of thinking

Developmental theorists view the development of thinking in different ways. This development can be viewed in terms of direction from an initial to a final condition, in terms of processes, for example conditioning and attending, and in terms of stages. Some theorists utilise one of these standpoints, others a combination of the above mentioned ways. Stages of thinking represent a logical way of noting progressive changes in cognitive structures. Stages have implications for curriculum development in that objectives at a particular level in education need to be matched to the respective intellectual stage of development of the child. In this section a classical and a contemporary model of how thinking develops is discussed.

Piaget (1963) revolutionised the way children were seen as passively reflecting the world to actively engaging the world to gain knowledge. He stimulated thought and numerous other theorists, for example Case (1998) and Fischer (Fischer & Bidell, 1998), have based their models on his original theory. Already mentioned are Piaget's four stages of intellectual development namely, sensorimotor, preoperational or symbolic, concrete operational and formal operational which have formed the basis on which many developmentalists have built their theories. He stated that the sensorimotor stage occurs between birth and 18 months. During this stage the infant learns to differentiate herself/himself from the external world; learns object permanence which enables the child to understand that an object continues to exist even when out of view, cause and effect and that time and space exist independently. The preoperational or symbolic stage occurs between 18 months to 7 years and represents the preschool years. The preoperational stage is divided into two stages. The first extends from age two to four years and is characterised by egocentric use of language and dependence on perceptual skills to solve problems. The second lasts from about age five to around seven and is marked by more social speech and greater use of intuitive thinking than perception. As this substage is dealt with in this study, it will be further elucidated.

Piaget (1963) emphasised the role of language in the development of cognition as it performs a social function; enables internalisation of words into thought and internalises action so that problems can be solved by using speech and not having to rely on concrete manipulation. The child learns to represent something with something else as in speech, play, gestures and thought. The child becomes less egocentric and more able to view the world from others' perspectives. Children of this stage are dependent on perception as

they are unable to reason. For this reason, perceptual skills as a foundation for later learning has been emphasised in the programme of stimulation used in this study.

From seven to 11 years the child enters the concrete operational stage. The child learns logic and the manipulation of ideas. In the last stage of formal operations of beyond 11 years, the child can reason abstractly (Piaget, 1963).

Piaget (1963) showed that the child's world was not a mini-adult's world and that children of different ages differed from each other. However, Piaget has been criticised for stating that development must occur in the same sequence for all children which in essence has not been disproved for average children although variations have been noted individually. A further criticism involves omitting the influence of social forces in the environment on the intellectual development of the child (Thomas, 2000).

Similar to Piaget (1963), Lowery's (1991) stages are invariant and follow a sequence common to all cultures (although he labels his stages differently). Lowery's model differs from that of Piaget in that he elaborates on the stages of intellectual development after 11 years and links the development of thinking of the child to more contemporary ideas reflecting the influences of everyday life and the relationship of the child with the environment.

Lowery (1991) has divided the development of thinking into seven stages. Stage One occurs at about one year of age with the establishment of object permanence. The second stage emerges at about three years of age. The child starts to group two things together on the basis of common attributes. This enables the child to understand similarities, differences, one-to-one correspondence, measurement, symbols, and learn how to read, play an instrument and imitate physical routines. This preschool stage includes similar achievements as in Piaget's (1963) preoperational or symbolic stage. Stage three starts at about six years and is established at about eight years. The child learns to group all objects together on the basis of a common attribute. The understanding of the concepts of all and some follow as the child learns to understand and generate rules. Stage three thinking is all that is required for everyday life. Stage four occurs when a child can mentally combine more than one idea at a time. This stage continues from about eight to ten years. The understanding of deductive reasoning heralds in stage five. For this to develop the curriculum needs to become more abstract and encourage the thinking of relationships among objects or ideas. At about 13 years the student enters the sixth stage of thinking. Organising and re-organising a collection of objects or ideas in different ways and the evaluation of complex problems from different combinations of relationships that exist among them become possible. Stage seven is characterised by flexibility of thought and appears at about 16 years of age. The student is able to develop frameworks based on a logical rationale about the relationships among objects or ideas while realising that other frameworks based on other categories can be formed (Lowery, 1991).

The future of stage theories lies in their ability to account for the processes that contribute to development and for the contexts in which development occurs (Thomas, 2000).

For thinking to develop properly the child needs a long childhood free from having to be concerned by survival activities. This leads one to ponder the issue of how poverty in our

country represents a barrier to learning in that underprivileged children are concerned with survival as opposed to actualising their potential (Luiz, 1999).

The contribution of parents in the cognitive development of children is explored in the next section.

2.2.3.3 The role of parents in cognitive development

Parents are key to the educational process. The child's school readiness is optimised when parents and teachers engage in a partnership. Many early intervention programmes have been shaped by the notion that children's development should be studied in the contexts of family and community (Bronfenbremmer, 1979). Although this ecological perspective is supported, this study focussed on quantitative improvements in the abilities of preschoolers.

Sigel (1991) and Clarke and Clarke (2003), emphasise the contribution parents can make in the advancement of their children's thinking. Sigel (1991) reported on studies conducted at the New Jersey educational testing service that showed children whose parents conform to social convention do less well on problem-solving and thinking tasks than do children whose parents are progressive and democratic. Progressive and democratic parents who place higher-level demands on their children influenced general test scores positively and encouraged independent thinking. Parents' communication strategies affect the intellectual functioning of their children. Children of parents who used authoritative, didactic teaching strategies did less well on problem-solving tasks requiring reflective thinking, memory for stories and on standard intelligence tests than parents who encouraged representational competence. Representational competence is the ability to transform all concrete experience into a symbolic form and realise that the concrete experience and the symbolic representation is the same. When a child becomes representationally competent he can anticipate, plan and predict future events, reconstruct the past and transcend the present. Thus he is able to think and solve problems. Representational competence is fostered by interaction between adults and children. Interaction based on mutual discussion and open-ended questions which require the child to infer, generalise and abstract enhance representational competence.

Authoritative parenting practices, however, have been associated with parent involvement and positive child outcomes in North America (Robinson, Hart, Mandleco & Olsen, 1996) and in Taiwan (Chen & Luster, 1999).

Current research confirms the benefits of involved parents in their preschooler's education. Pelletier and Brent (2002) examined the effects of 59 English second language and 64 English first language parents on their children's school readiness in a Canadian preschool intervention programme. The programme aimed at parent education and parent involvement gave parents opportunities to acquire the necessary skills to support their children's transition to school over 12 weeks. The aims of the research were to identify how characteristics of parents interact with efforts of teachers to involve them. Overall findings suggested that parents who perceive themselves as more effective are more involved in their children's education. English parents had higher self-efficacy ratings. English second language parents were significantly less involved than the English parents. Their lesser involvement was viewed in the light of the language barrier and their recent

immigrant status. High efficacy beliefs mediate the effects of stressors that may be associated with economic disadvantage and promote adaptation that contributes to positive development in their children. It was also found that teachers were able to influence parent involvement and their feelings of self-efficacy.

How gender affects cognitive development is explained in the next section.

2.2.3.4 The role of gender in cognitive development

Hyde and McKinley (1997), amongst many, report a commonly held belief on the differences between male and female brain physiology. Female brain organization represents linguistic and spatial ability in both cerebral hemispheres, while in men, language is localized in the left and spatial abilities in the right hemisphere. Springer and Deutsch (1997) describe some studies which have shown anatomical differences accounting for lateralisation. Kulynych, Vladar, Jones and Weinberger (1992) found that the planum temporale was 38% larger in males in a Magnetic Resonance Imaging (MRI) study. Witelson and Kigar (1992) found a larger horizontal component in the left hemisphere in males than in females. Witelson, Glezer and Kigar (1995) observed that the isthmus is relatively larger in females and that women have a higher density of neurons in the auditory association cortex. The shape of the corpus callosum is different in the sexes (Allen, Richey, Chai & Gorski, 1991).

Shaywitz et al. (1995) demonstrated differential patterns of activity in the brains of men and women during a cognitive task using functional MRI to measure blood-flow changes in 19 men and 19 women, all of whom were right-handed. The researchers concluded that brain activation in males is lateralised to the left inferior frontal gyrus region during phonological processing, whereas in females, more diffuse neural systems are engaged in both hemispheres.

One explanation for this differentiation is the fact that high levels of testosterone are present in the male foetus which slows left hemispheric development and generates greater right hemispheric development. This gives rise to the male's greater spatial ability and higher incidence of learning difficulties. This explains why girls have greater verbal ability than boys and boys excel in mathematics and are physically more aggressive than girls (Kolb & Whishaw, 2003).

In the past, it has been shown that by the time children reach adolescence more boys study mathematics and science, and girls show more interest in language and the humanities. However, this tendency appears to be disappearing in certain societies as evidenced in research. Feingold (1988) for example, examined the courses and performance of boys and girls over a decade and commented on this tendency.

The differences in male and female cognition influences social problem-solving abilities. Walker, Irving and Berthelsen (2002) assessed problem-solving skills in the areas of provocation, peer group entry, sharing and taking turns in preschool boys and girls. The sample of 179 children was divided equally between the two genders. They found that girls' responses were more competent and reflective of successful functioning with peers than the boys. The strategies used by the girls involved less need for retaliation, verbal or

physical aggression. The conclusion of the study was that girls and boys do approach problematic social situations differently.

A discussion on how one's view of cognitive development affects one's approach to the assessment of children follows.

2.2.3.5 Assessment and cognitive development

One's approach to assessment is influenced by one's view on cognitive development. Children with delayed development are often subjected to assessment to identify areas of difficulty in order that a plan to assist the child be developed.

Burden (1996) criticises traditional assessment procedures for falling short of meeting certain human basic rights. He recommends a constructivist approach where there is permission for the assessment, that the child is assessed thoroughly, that feedback is given and that the process is an enhancing one for the child's future. During the evaluation there is a discussion about the value of the assessee's strategies and learning styles and the teacher facilitates more effective approaches to solving the problems (Burden, 1996).

Burden (1996) advocates Reuven Feuerstein's (1980) theory of structural modifiability which appreciates culture, value systems and emphasises the role of mediators in the cognitive development of the child. It links assessment with intervention. This theory provides a means of improving the learning capacity of disabled learners (Instrumental Enrichment) and a dynamic assessment tool (Learning Potential Assessment Device). This is an interactionist method of assessment which places process before product, intervention before labelling, teaching before observation and the real world of the individual before the ideal world (Feuerstein, 1980).

Donald, Lazarus and Lolwana (2002) emphasise the purposes and effects of assessment. Constructivist principles applicable to assessment are assessing competence in both form and content, tracking progress diagnostically to actualise potential, performance-based assessment and assessing potential in the mediating way Feuerstein (1980) suggests.

This alternative system of evaluation transforms the testee into a learner-performer (Feuerstein, 1979). Kriegler and Skuy (1996) note that assessment associated with opportunities for learning benefit the individual child's needs in an interactional and functional way. In this way mediation transforms assessment into an opportunity for learning.

The cognitive development of a child has been covered in this section. As overall cognitive capacity correlates with language competence, speech development is reviewed in the next section. From a reverse point of view, the symbol system of language may stimulate advances in cognition (Gardner, 1982).

2.2.4 Speech development

The development of language is explored in this section because of its inextricable link with the development of the child. It is recognized that many children who experience difficulties with oral speech and language in the preschool years go on to have major difficulties with literacy once they are at school (Stackhouse, 2001).

Contrasting positions on the acquisition of language exist which influence one's view of normal versus delayed development in language. Normal speech milestones are listed so that normal language development can be identified. The role gender plays in the development of language concludes this section.

2.2.4.1 Perspectives on the acquisition of language

Many people, for example, Chomsky (1980) believe that speech is acquired in the same way as basic motor skills, by maturation. Chomsky (1980) represents the nativistic position with his theory of inborn language which is in direct contrast with Piaget's (1963) perspective which represents the opposing empiricist position on language which is regarded as dependent solely on interaction. Speech is a derivative of heritage and is not a natural function. The child must be taught and be encouraged to talk. As the baby enters the world crying, he has begun to speak. This innate vocalisation develops the child into realising that mother responds and auditory comprehension is born (Athey, 1990; Tomasello, 2001).

The interactionist or constructivist theory to language acquisition is based on the interaction of inborn abilities to formulate rules, act physically upon the environment, and seek social interaction. The child constructs through his own activity and thinking in varied social situations, knowledge about how language works from patterns of language around him (Genishi & Fassler, 1999; Tomasello, 2001).

A position midway between the two positions acknowledges the innate capacity of a child to learn language which develops through interaction with his world (Gardner, 1982).

Irrespective of one's belief regarding development, normal developmental milestones occur at about the same time for all children. Normal language developmental milestones will be discussed next.

2.2.4.2 Language milestones

Smiling occurs between four to six weeks of age. The infant's first "speech" follows about two weeks later with cooing in response to social verbal interaction (Franzen & Berg, 1998).

Babbling between eight and twelve weeks represents all speech sounds for any language. Between the third and fourth month the infant becomes aware of the sounds he is making and starts to repeat them. This lalling gives an indication of whether the child is hearing or not as a severely deaf child will not move beyond this stage of speech as he cannot stimulate himself through his faulty hearing. At about nine months the child can respond to his name and understand "no" (Brant & Holt, 1986).

Between 10 to 11 months first words, parts of words or shortened words or sounds which are similar to words are spoken with understanding (Franzen & Berg, 1998).

Speech and understanding follow the same stages in all children. Initial use of single words changes to two word phrases. These phrases increase to three to four word phrases from two years. By three years the child speaks in short sentences and his vocabulary reaches about 1000 words (Gregory, 1986).

From five years a child should be able to follow a triple order instruction for example, put this on the chair, open the door, then give me that book (Illingworth, 1980).

The last stage of language development is attained when a child is able to use adult type language structures at between five and six years (Wiechers, 1996). This is important as the child entering the school environment is expected to have attained language on this level in order to learn (Grové, 1984).

2.2.4.3 The role of gender in language development

Language development is different in boys and girls. By the end of the first year of life, children are treated in linguistically distinct ways by their caregivers (Eisenberg, 1999). Gleason, Ely, Perlmann and Narasimhan (1996) have observed that middle class American boys receive more prohibitions from caregivers than girls of a similar age. Fivish (1993) indicated that mothers of girls talk more about emotions than mothers of boys. These differences may contribute to different male and female communicative styles.

Richner and Nicolopoulou (2001) demonstrated differences in narrative style. They analysed stories told by preschool boys and girls of different socio-economic and geographical backgrounds. They found that girls embedded and developed responsible interdependent characters. Boys created stories of individual antagonistic characters.

Many researchers for example, Brant and Holt (1986) have noted that language development in girls is superior to that of boys. Girls, on average, acquire words one to two months earlier than boys. Girls develop larger vocabularies and use linguistically more complex constructions. The speech of young girls is better enunciated than boys' speech (Kolb & Whishaw, 2003).

In the next section normal motor development will be discussed.

2.2.5 Motor development

In this section the significance of normal motor development for learning is explored. As gross-motor development corresponds with fine-motor development, both gross- and fine-motor co-ordination will be reviewed. A delineation of normal motor milestones and the role that gender plays in motor development concludes this section.

2.2.5.1 The development of motor function

According to Laszlo and Bairstow (1985) effective interaction between a child and the environment depends on the child's ability to explore and manipulate that environment. This classical view is re-iterated in the contemporary constructivist position in which the interaction of a developing child with a dynamic environment is important for development (Hodapp, 1998).

The capability to execute purposive movements begins with the whole-body movements of the newborn controlled by reflexes. Gradually midbrain and cortical control transfer the dependent baby into an independent upright adult. In the past, early motor development was thought to have a direct relationship to physical maturation. The ideas of Savelsbergh, Wimmers, Van der Kamp and David (1999) represent contemporary thinking on motor development. Motor development is characterized by discontinuities, jumps, instabilities and regressions. Each new skill develops from a less organised skill. More skilled movements are dependent on a combination of maturation, practice and environmental learning.

Development is in a cephalocaudal direction, from the head to the extremities. The first step to walking is control of the head. Control of the extremities happens last (Gallahue & Ozmun, 1998; Illingworth, 1980).

Children's development depends on internal and external factors which explain individual differences. Internal factors include growth and maturation, increase in cognitive capacity, and personality and motivation. Changes in neural structure enable faster transmission and coding of movement information. Children who are confident experience a wider range of movements than those who lack self-confidence. Other factors are nutrition, health and fitness. External, environmental factors include the amount of time spent practising motor skills and the stimulation children receive (O'Brien & Hayes, 1995).

O'Brien and Hayes (1995) view the development of motor ability in three phases. The first phase of motor control is when children develop a rudimentary ability to control their bodies. In the second phase they increase their control and are able to perform more complex movements in response to external demands. Achievement of advanced control in the third phase widens the quality and range of movement to the individual's greatest capacity. Units of action or synergies are stored in a generalised motor programme. With increased maturity well-learned and automated units of action, together with posture and biomechanical constraints (muscle tone, sensory integration) are used when performing a complex movement.

O'Brien and Hayes's (1995) third phase of the development of motor ability is explained in the theory of motor control. The individual achieves control over the many possible muscle actions of the body, by grouping them into an organised system of constraints. These consist of synergies of muscle linkages, neurally based synergies, synergies based on reflexes, posture and flexion and extension of muscles. Synergies produce a pre-determined movement pattern as seen in the early phases of co-ordination. Cognitive control of movement is achieved by a neural system with multiple levels of control where abstract representations of movement are formulated and interactions occur between perception and sensory integration. The lower level of control is where abstract movement is translated into units of action based on reflex and learned movements at the spinal cord

level. This reduces the processing load on the central nervous system and explains how control is achieved over the large number of units of action that need to be controlled during complex movements (O'Brien & Hayes, 1995).

There appears to be an orderly progression within each of the skills of walking, running, jumping, catching and throwing as purported by Piaget (1963). There is sufficient similarity in sequential progression through the developmental levels in different groups of children for many characteristic patterns to be regarded as stable and representative of a level of development (O'Brien & Hayes, 1995).

O'Brien and Hayes (1995) found in their research that mature patterns of fundamental movements, for example walking are not present in a young child but that with maturation, learning and practice, these patterns mature much later. Children with delays may evidence some of the elements of the pattern but in terms of the spatial and temporal characteristics, the mature configuration may not be present. The theory of motor learning control is important to the understanding of the observed qualitative difference between normal and motor-impaired children.

Normal motor milestones are mentioned below.

2.2.5.2 Motor milestones

The curled-up position the baby lies in during the first few days, with arms and legs tucked under and bottom slightly raised, is similar to the foetal position. From one to two months as the muscles of the back and neck strengthen, the baby will start to hold up his/her head. By three to four months, (s)he will be able to push up on his/her forearms, and lift up his/her head and chest (Brant & Holt, 1986; Gallahue & Ozmun, 1998).

From three to four months a baby should be able to hold a small toy in his/her hand. The infant can sit unassisted at between six to seven months. At eight months standing while holding on to a piece of furniture is observed. Most children have learned to crawl by 10 months. Walking often starts at a year (Franzen & Berg, 1998).

By 18 months most children are able to pull or push a toy and start to run. At two years children learn to climb. Movements become more controlled at two and a half with jumping, standing on tiptoe and throwing being evidenced (Gregory, 1986).

At three years a child is able to jump off a bottom step, climb stairs one foot per step, descend stairs two feet per step, stand on one foot for a few seconds and ride a tricycle. Regarding fine-motor skills, a child of three years is able to copy a circle and draw a rudimentary man. At four years children can descend stairs one foot per step and skip on one foot. At four years a child can copy a cross and a square. At five years a child can copy a triangle. At six years a child can skip on both feet. At this age a fairly complete version of a man is able to be drawn and a diamond copied (Gallahue & Ozmun, 1998; Illingworth, 1980).

It is important that a child attain a certain level of both gross- and fine-motor co-ordination on entry to school. Delays in these areas affect how the child adapts to his new environment and may impede learning (Grové, 1984).

The role of gender is touched on in the next section.

2.2.5.3 The role of gender in motor development

Gender plays a role in motor ability in boys and girls. Differences may be observed in terms of height and weight, but Gallahue and Ozmun (1998) regard these as minimal. The physiques of male and female preschoolers are similar with boys being slightly taller and heavier. Boys have greater muscle and bone mass than girls. This influences the sensory apparatus which is still developing during the preschool years so that perceptual abilities can become increasingly refined during these years.

The sociological perspective regarding the role of gender views the different behaviours of male and female children as resulting from the positive or negative feedback they receive in terms of the appropriateness of their behaviours (Beckett, 2002). This may explain why boys are more active and girls, more sedate. For example, differences can be observed in exercise play such as running and climbing (Pellegrini & Smith, 1998). Boys, more than girls, engage in rough-and-tumble play. Carson, Burkes and Parke (1993) attribute these sex differences to modelled and reinforced behaviours. Fathers more than mothers play rough-and-tumble with their sons rather than their daughters. The male predisposition to greater physical activity is caused by the effects of androgens during foetal development. These social learning and biological influences influence gender differences in motor ability (Collaer & Hines, 1995).

The development of motor function, motor milestones and the role of gender have been discussed in this section. The concept of school readiness will be explored in the next section.

2.2.6 School readiness

Readiness for school is a developmental task that involves adaptation for both parents and child (Pelletier & Brent, 2002). As already mentioned, the child's learning takes place within a social context (Bronfenbremmer, 1979). In line with the ecological perspective, Meisels (1999) questions whether children are ready for school or whether the school is ready for the children. This highlights the importance of the school's role in adapting to the children (Cassidy, Mims, Rucker & Boone, 2003).

Normal development culminates in school readiness. School readiness is based on the biological growth of the physical and neurological systems and the influence of the environment. Grové (1984) and Paro and Pianta (2000) differentiate the physical, perceptual, emotional, social and cognitive aspects of school readiness. This section concludes with an account of instruments used to assess school readiness.

2.2.6.1 Physical maturation

Physical school readiness has been attained when the child has the appearance of a school-going child. He has the physical development and health which will enable him to adapt to the demands of school. He has normal sensory development especially regarding vision and hearing. He has the ability to see to personal needs such as getting dressed and using the bathroom. Adequate gross-motor co-ordination (for example walking, jumping, stretching and running) has been achieved, including the development of body image, laterality, spatial orientation, sense of direction and balance. The child has attained an adequate level of fine-motor co-ordination (to enable the child to hold a pencil to write) (Grové, 1984).

Oja and Jurimae (2002) performed research to examine the link between physical activity, motor ability and school readiness. They used questionnaires, motor and school readiness-related tests on 294 healthy six year old children of mixed gender (161 boys and 133 girls) from Tartu, Missoula. Motor ability was assessed using various tests from the Eurofit ball and the Three Minute Endurance Shuttle Run tests, questionnaires were completed by parents and teachers, and the Controlled Drawing Observation test was used as predictor of school readiness and development of mental abilities. Their results showed that motor ability correlated positively with school readiness levels.

2.2.6.2 Perceptual abilities

According to Grové (1984) adequate perceptual development is achieved through adequate development of visual and auditory discrimination, visual and auditory memory, sense of rhythm, visual and auditory analysis and synthesis, conservation of quantity, number concept, figure-ground discrimination, form constancy and spatial relations (Grové, 1984).

2.2.6.3 Language development

Adequate language development is achieved when the child has attained adequate language comprehension to adapt to a formal learning situation. He has the ability to recognise heard words, name objects and describe an experience. He is able to repeat information, retell a story and speak in an understandable way. Baby language is no longer used in children who are ready for school. The child is able to express his feelings and engage with others intentionally and he is able to understand and respond to descriptive language (Grové, 1984).

2.2.6.4 Cognitive development

An acceptable level of cognitive development is attained when the child is able to use logical thought, classification, logical and associative memory, series formation and number concept (Grové, 1984).

2.2.6.5 Emotional and social development

Although school readiness screening focusses on academic skills, the child's social and behavioural skills are important indicators of competence. The child's abilities to relate to peers and teachers and adjust to new environments as they move through early school years contribute to early school success (Meisels, 1999).

However, Paro and Pianta (2000) caution that prediction of social and behavioural outcomes is relatively poor even when similar assessments are used as predictors and outcomes. The difficulty in prediction is poor due to children's behaviour which is known to be different in different contexts and unstable over time and behaviour in school is complex and determined by many variables.

Grové (1984) lists the criteria for adequate emotional and social development as an ability to separate from the home environment; to control emotions and impulses; to respect others and their possessions; to share the teacher's attention with others; to adapt to a new environment and routine; absence of asocial behaviour; respect for authority; a positive self-image; self-confidence; intentional behaviour; self-evaluation; ability to solve problems; direct attention appropriately; self-discipline; positive attitude to work and endurance that enables the child to complete tasks.

Webster-Stratton and Reid (2004) have shown that a programme designed to increase children's social and emotional competence, decreased problem behaviours and increased academic competence. In two randomized control group studies, four to eight year old children with conduct disorders participated in a weekly two hour 20-22 week treatment programme. Reductions in aggression and disruptive behaviour and increases in pro-social behaviour and positive conflict management skills were noted in children who received the intervention compared with untreated groups. Improvements were maintained one and two years later.

The different aspects of school readiness have been outlined in this section. In order for children to cope successfully in the formal learning situation of grade one, children need to be ready for school. The criteria for school readiness (as listed above) serve as a guide.

Instruments used to assess school readiness will be dealt with in the next section.

2.2.6.6 Instruments to assess school readiness

Although school readiness is defined in terms of a child's skills, abilities and dispositions, techniques used to assess and determine school readiness involve tests of preacademic skills including motoric, cognitive, perceptual, sensory and social behaviour (Paro & Pianta, 2000).

Psychologists utilise many different instruments to assess school readiness. Goldstein, Beers and Hersen (2004) make a valid point in that both intelligence and developmental batteries may be used to evaluate school readiness as the dividing line between these tests is blurred due to the immaturity of the child.

In South Africa the following tests are used:

Group Test for the Evaluation of School Readiness for five and a half year old preschoolers. The following aspects are tested: Visual Perception, Spatial Orientation, Numerical Comprehension, Drawing of a Person, Language Acquisition, Auditory Perception, Fine-Motor and Gross-Motor Co-ordination. There is no time limit. Subtests of this test were used in this study as a selection instrument.

Aptitude Test for School Beginners (ASB): This test consists of eight tests: Perception, Spatial, Reasoning, Numerical, Gestalt, Co-ordination, Memory and Verbal Comprehension. The recommended time to administer this test is within the first two months of the child's grade 1 year. There is no time limit. The test can be administered to groups.

Griffiths Scales of Mental Development (Griffiths Scales): The scales consist of the following subscales: Locomotor, Personal-Social, Hearing and Speech, Eye-and-Hand Co-ordination, Performance and Practical Reasoning. The Revised Griffiths Scales of Mental Development was used as a measuring instrument in this study. The Griffiths Scales is an individual test and can be used from two until eight years of age. This test takes about an hour to administer.

An evaluation of school readiness can be made on the basis of the combination of an IQ test, for example, the Junior South African Individual Scale (JSAIS), the Draw-a-Person and perceptual tests such as Frostig Developmental Test of Visual Perception and Tests of Auditory Perception. The twelve subtests of the JSAIS used to constitute an IQ are: Form Board, Vocabulary, Ready Knowledge, Number and Quantity Concepts, Memory for Digits, Block Designs, Story Memory, Picture Riddles, Word Association, Absurdities A: Missing Parts, Absurdities B: Absurd Situations and Form Discrimination. Norms for the JSAIS are available for children from 3 years until 7 years 11 months. Testing time ranges from 45 minutes in the case of a younger child to an hour and a half in the case of a child of more than six years of age. The JSAIS is an individual test.

In the USA the following are some of the most widely used tests to assess school readiness: The Kaufman Assessment Battery for Children (K-ABC), the McCarthy Scales The Miller Assessment for Pre-Schoolers (MAP), the Young Children's Achievement Test (YCAT), The Differential Ability Scales (DAS), and the Batelle Developmental Inventory.
In the United Kingdom (UK), IQ tests standardized on children in the UK, many of the above-mentioned North American tests and the Griffiths Scales of Mental Development are used. These tests are all similar to tests used locally in that most test motor, verbal, non-verbal, memory abilities and emotional maturity.

Instruments used to assess school readiness have been described. When a child does not meet certain criteria so as to be regarded as ready to be enrolled at school, he is at risk for learning.

This problem is reflected for example, in the Early Childhood Longitudinal Study in the USA in the kindergarten class of 1988/1999 which showed disturbing levels of inadequacy in reading and maths readiness for school. The researchers reported concern for the at risk status of these children (Manning & Patterson, 2003-2004). Cloete and Kok (1988) and Donald, Lazarus and Lolwana (2002) confirm that in South Africa there are many children entering formal education who are not school ready.

Hodapp (1998) sees the development of children with disabilities as differing from that of non-disabled children. Developmental delays are dealt with in the next section.

2.3 DEVELOPMENTAL DELAYS

This section discusses developmental delays. A definition of developmental delay is given to assist in determining whether there is a delay or not. Causes of developmental delays follow.

Constructivist principles encourage one to view delays not only from a physiological perspective but from the context of the children's environment. Donald, Lazarus and Lolwana (2002) view developmental delays as barriers to learning.

2.3.1 Definition of a developmental delay

A developmental delay is based either on deviation in standard score units on a norm-referenced test and/or percentage deviation of chronological age from developmental age (Sheehan & Sites, 1989). This definition explains a delay in terms of test scores or development and thus has universal use.

2.3.2 Etiology of developmental delays

A developmental delay may be caused by any of the following:

2.3.2.1 Asphyxia in the foetus and neonate

Asphyxia is defined by Phibbs (1994) as the condition which occurs when the organ of gas exchange fails (placenta or lungs of the newborn). The outcome following perinatal asphyxia is cerebral palsy with or without cognitive delay. Severe cognitive delay or any type of cerebral palsy can occur after fetal or neonatal distress. Neurological difficulties (for example epilepsy) and neuro-sensory hearing loss are other sequelae causing developmental delays (Robertson, 1997).

2.3.2.2 Brain injury

This section outlines how brain injury causes delayed development in children. Different types of brain injury, how head injury occurs, the assessment of the severity of brain injury, recovery, delayed sequelae and outcome unique to paediatric brain injury, are briefly described.

Accidents are a main reason for brain injury. Children in the four to twelve year range are victims of falls, sporting accidents and motor vehicle accidents (Fletcher, Ewing-Cobbs, Francis & Levin, 1995). Falling accidents account for between 55 to 65 percent of injuries to the head in children (Rivara & Mueller, 1986).

The Shaken Baby syndrome can result in brain injury. It is described by Kruger (1997) as the shaking of babies by their caretakers. Shaking can damage the developing brain in children up to two years of age. Injury is due to shearing injuries to unmyelinated cerebral tissue and multiple cortical haemorrhages which result from torn bridging veins (Bruce, 1995).

Head injury damages the brain by contusion (bruising where small blood vessels tear and blood leaks into the brain) and lacerations (tears where hematomas result). Shear strain

injury causes stretching and depolarisation of axons resulting in inefficient electrochemical activity and diffuse cognitive deficits. Shearing occurs inter alia in acceleration and deceleration vehicle accidents. Secondary brain injury is associated with worst outcome (diffuse brain swelling and increased intracranial pressure) (Michaud, 1995).

Traumatic brain injury is assessed by using the Glasgow Coma Scale (GCS) and was developed by Teasdale and Jennett (1974). Scores are assigned to the person's level of eye opening, verbal performance and motor response. The total score ranges from three (no response to stimulus) to 15 (best response to items). Part of the scale relies on verbal response which limits its use with pre-verbal children. A South African and a paediatric version of the GCS has been developed (Nell, 2000; Reilly, Simpson, Sprod & Thomas, 1988). A severe injury is indicated when a command cannot be responded to 24 hours after the accident. Although the evaluation is done six hours post-trauma, the result may not be reliable as improvement or deterioration can occur. Severity of injury is also assessed by the duration of impaired consciousness and post-traumatic amnesia (Fletcher et al., 1995).

Wrightson and Gronwall (1999) explain important differences in the way children respond to trauma from adults. The size of the head, the relative weakness of neck muscles and incomplete myelination of the brain cause a different response to the forces of acceleration. The skull of the child is less rigid and more of the physical injury may be absorbed causing greater shearing. Extradural haemorrhage can occur without a loss of consciousness, bruise or fracture. The initial response to trauma in children under five years of age may be slight with either a short period of unconsciousness or none at all. However, drowsiness, nausea and vomiting may occur three to four hours later. An assessment of the child's neurological state is not feasible as difficulties exist in estimating higher cerebral function; there may be an emotional response to the trauma and natural tiredness may be confused with pathological drowsiness. When a computed tomography (CT) scan has been indicated and found to be normal, the child needs to remain under observation as deterioration can still occur. This effect has been demonstrated by Levin, Ewing-Cobbs and Eisenberg (1995). Some children who sustained brain injury where no physical evidence of this could be found showed up later with delayed sequelae. Decreased cognitive skills were identified in later cognitive assessment in the absence of MRI pathology at the time of injury.

In the past it was thought that injuries to young children were less dangerous than to older children (the so-called "Kennard Principle"). Kennard (1942) proposed that there must be some change in the synaptic organization that was supporting the functional recovery. Three reasons in support of Kennard's Principle come from Kolb, Gibb and Gonzalez (2001). Firstly, they suggest that a change in the organization of local cortical circuits in regions directly or indirectly disrupted by the injury can aid recovery. The second reason is that there could be generation of new circuitry as reparative processes can be stimulated by behavioural or pharmacological therapy. Thirdly, they postulate that there could be generation of neurons and glia to replace some of the lost neurons, which is the process of neurogenesis.

A criticism of this principle is that it does not account for those conditions under which early brain damage results in severe functional loss such as cerebral palsy. Kolb, Gibb and Gonzalez (2001) offer a further example of when recovery is impossible. If visual area 1 which has its own inputs and outputs is damaged, recovery would be impossible because the information generated in this area could not be duplicated elsewhere.

Hebb (1947) correctly explained this contradiction concerning recovery. He suggested that some types of early injury might prevent the development of certain intellectual capacities that are critical to normal development. Another reason why recovery is different at different ages is that the developing brain is different in structure and organization at different ages (Kolb, Gibb & Gonzalez, 2001).

These different effects of brain injury in children were demonstrated in Teuber and Rudel's (1962) classical study of brain-injured children which holds today. One brain-injured group showed progressive recovery over time. Constant, stable impairment was found in a second matched group. In a third brain-injured group no discernible deficit was identified initially, but over time, as different neuro-cognitive structures became activated in their developmental sequence, then specific deficits came to the fore.

Wrightson, McGinn and Gronwall (1995) concur with Teuber and Rudel's (1962) results. They confirmed this last finding in their research on brain-injured children and found that evidence of brain injury sometimes only surfaced at a later stage. Evidence for the later surfacing of deficits was shown in Bijur, Haslum and Golding's (1990) longitudinal study. When mildly head-injured children were given a test of mathematical ability at the age of ten years, those injured at five or six years performed less well than those who were injured when they were older.

The full scale Intelligence Quotient (IQ) at the initial testing session was found to be the best predictor of neurological sequelae. In British Columbia research was conducted where head injured children were followed for five years and sequelae were correlated with IQ (Klonoff, Crockett & Clark, 1984).

Fletcher et al. (1995) confirmed the poorest outcome for young children, and a poorer outcome for severely brain-injured older children than for children with mild to moderate injury. A study by Grafman and Salazar (1995) showed that a better outcome can be predicted in a head injury if the child was functioning at a higher intellectual level or is from a higher socio-economic group.

A modified pattern of neural activity is often found during and after recovery of function. Other areas of the brain become unusually active compared with the areas noted for subserving performance on a specific task. Functional magnetic resonance and other neuroimaging studies hold out hope of being able to examine recovery rate in injured areas by plotting changes in functional activity (Grafman & Salazar, 1995).

Even though relocalisation of function and the plasticity of the young brain can account for recovery of brain injury, numerous factors such as the age at which the injury occurred and the severity of the injury can leave a child with sequelae which affect development negatively.

2.3.2.3 Congenital malformations of the brain

Abnormalities in the brain are viewed from different perspectives by different theorists. Which ever way an abnormality is regarded, it still places a child at risk developmentally.

Neural tube defects can arise in the developing embryo. Many children born with malformations of the brain die after birth (Lemire, 1997).

Sensory deficits due to lesions in the receptor organ, peripheral nerve route or central nervous system may cause difficulties in audition, visual processes or tactile sensation (Franzen & Berg, 1998).

Hynd, Semrud-Clikeman, Lorys, Novey and Eliopulos (1990) present a different perspective. They have demonstrated evidence of abnormalities in different areas of the brain thought responsible for learning difficulties.

The physiology of the brain determines how information is processed. Two types of cognitive processing which have been given a number of different names: left and right, sequential and simultaneous, linguistic and visuo-spatial, analytic and holistic may account for differences in processing in children with learning difficulties (Jansen, 1996).

The maturational-lag hypothesis has been put forward as a reason for developmental delay (Kolb & Whishaw, 2003). This hypothesis states that cognitive functions develop hierarchically and sequentially. Should one lower order function that supports a higher order function be slow to develop, other cortical functions may be affected. Portwood (1999), in her discussion on reasons for dyspraxia, attributes the reduction in the number of reinforced interconnections between nerve cells in the cerebral cortex as the reason. This results in the cortex remaining immature. In the past it was believed that the child could outgrow this immaturity but research findings by Schonhaut and Satz (1983) and more contemporary research by Adam et al. (2002) do not provide evidence for this. This research demonstrated that inattentive children diagnosed with attention deficit hyperactivity disorder have a central nervous system abnormality or cortical hypoarousal.

These contradictory findings do not cause one to terminate therapy where it may be of benefit. Although therapy cannot change the anatomical abnormality it can assist in developing other strategies to compensate for the difficulties. As already mentioned, Kolb, Gibb and Gonzalez (2001) provide further reasons for therapeutic intervention in that neuroplasticity enables neurogenesis, the generation of new circuitry and relocalisation of function which is known to be stimulated by behavioural and/or pharmacological therapy.

2.3.2.4 Illnesses

Illnesses suffered by the mother for example, rubella (German measles), toxoplasmosis, varicella, syphyllis, genital herpes simplex virus, Aids (Prober & Arvin, 1997), or the infant for example, hypoglycemia (Cornblath & Schwartz, 1997), hyperbilirubinemia (Stevenson, Schwartz & Dennery, 1997), and meningitis may place the child at risk for delayed development (Philip, 1997).

Wilson (1998) adds cystic fibrosis, diabetes, rheumatoid disorders, leukemia and other forms of cancer to medical conditions which can affect a child's development. Often the prescribed medication has side-effects for example, chemotherapy or medication for seizure control which causes lethargy or impairs concentration.

2.3.2.5 Psychological reasons

Garbarino (1997) refers to social toxicity (violence, poverty, disruption of family relationships, despair, depression and alienation) which harms children in a psychological way.

Donald, Lazarus and Lolwana (2002) emphasise the interaction of these factors and the context in which they exert influence in South Africa. They regard discrimination against people who are seen as different as a barrier to education.

2.3.2.6 Prematurity

The lower the gestational age, the higher the incidence of complications. Premature delivery occurs from 20 to 37 weeks (Druzin, 1997).

Preterm infants have significantly decreased nutrient stores and growth delays. Maternal-foetal nutrient delivery is maximal during the third trimester and being born early, preterm infants are denied this source of nutrients (Rao & Georgieff, 2000).

2.3.2.7 Low socio-economic status and poverty

Children may develop special educational needs, not as a result of intrinsic deficits of a physical or neurological nature, but because of the extrinsic factors of socio-economic disadvantage. Almost all the adversities that lead to negative outcome are problems of the poor and cost the state in special education, foster care, programmes for teenage parents, and the criminal justice system (Isenberg & Brown, 1997).

Children who come from impoverished homes where parents have little education or may be unemployed do less well on intellectual assessments and school performance than children from more privileged homes (Gottfried, 1984; Lalloo, 1997; Short, 1987). In South Africa large sections of the population suffer poverty and disadvantage. Children from this sector are especially at risk (Van den Berg & Naicker, 1996).

This is corroborated in research carried out by Votruba-Drzal (2003) who examined the influence of income in families on the cognitive stimulation of children. The study utilized data from the National Longitudinal Survey of Youth in a sample of 2 174 families. The result was the less income, the less stimulation the child received.

Deci and Ryan's (1985) research results associated a lack of motivation with poverty and disadvantage. In order to be motivated, people need to perceive relationships between behaviour and the outcomes that follow. The psychological growth and learning of children is affected by the unpredictability and unresponsiveness of the environment.

However, Bandura (1997) has shown that parents who have high efficacy beliefs about influencing their children's cognitive development have high aspirations for their children and raise their children's beliefs that they are capable of regulating their own learning and academic achievement. As already mentioned, Pelletier and Brent (2002) have demonstrated the effectiveness of their programme that trains specific skills to empower parents to have a positive influence on their child's development.

2.3.2.8 Maternal and paternal substance abuse

The use of alcohol, nicotine, prescription, over-the-counter and recreational drugs is associated with newborns of lower birth weight and cognitive difficulties (Franzen & Berg, 1998).

Foetal alcohol syndrome caused by maternal alcohol consumption of more than two drinks per day is recognised as the leading cause of mental retardation in children (Jacobson & Jacobson, 2000).

Cognitive defects include poor abstract reasoning and memory, poor judgment, inability to concentrate or process information and many evidence physical abnormalities as in deformed hearts or missing limbs. Societal conditions of poverty, poor child care and violence associated with prenatal drug exposure further disadvantage these children (Isenberg & Brown, 1997).

In a comparison study between children who had been exposed to drugs prenatally and non–exposed children, it was found that the exposed group performed poorer on focusing, IQ and school readiness skills and displayed inattentive behaviour. The sample included 103 children who were exposed to drugs and 33 who were non-exposed. The children were four years of age (Butz, Pulsifer, Leppert, Rimrodt & Belcher, 2003).

Not only are there adverse consequences to the foetus's exposure to maternal substance abuse; effects of various drugs on paternal sperm have been demonstrated (Halamek, 1997).

2.3.2.9 Genetic and chromosomal reasons

A few examples of genetic conditions which affect the normal acquisition of milestones in a child follow:

Phenylketonuria causes the buildup of phenylalanine, slower neural development resulting in mental retardation, attentional difficulties and hyperactivity. A child with Turner's syndrome has one sex chromosome (X), displays spatial deficits and has attentional difficulties. Down' s syndrome causes mild to severe intellectual impairment and physical abnormalities (Franzen & Berg, 1998).

The etiology of attention deficit disorder with hyperactivity or without is attributed to genetic and environmental reasons, and exposure to toxins.

Grigorenko (2001) quotes from the Human Genome Project that specific regions of the genome in dyslexia have been identified. Zametkin et al. (1990) show that the brain in

children with attentional difficulties is unable to use glucose fast enough to maintain normal patterns of thought. The chief protagonist is inattention which affects the learning of children.

Genetic factors have been implicated in some reading disabilities. Recent DNA studies have found evidence for a link between some reading disabilities and inheritance of a gene or genes on the short arm of chromosome 6 (Snow, Burns & Griffin, 1998).

2.3.2.10 Exposure to neuro-toxins

Inner-city children or those who live close to foundries or battery factories may be at risk of the ingestion of atmospheric neuro-toxins. The most well known and researched of these is lead which has been linked to mental retardation, decreased reflexes, weakness and slow nerve conduction (probably secondary to demyelination of the nerve axons). Children exposed to insecticides may be affected in a similar negative way (Franzen & Berg, 1998).

From 1980 Jacobson and Jacobson (1997) followed 313 children exposed prenatally to polychlorinated biphenyl chemicals whose mothers had consumed fish from the contaminated Lake Michigan. The toxic effects include dermatological anomalies, lower birth weight, hypotonia and findings have demonstrated poor performance on IQ tests at ages four and 11 years.

2.3.2.11 Nutritional deficiencies

The maternal diet will affect the growth of the foetus. Nutritional deficits in the diet of children may stunt their development. Poor nutrition is no longer only found in poor communities as evidenced in marasmus (calorie defiency) and kwashiorkor (protein deficiency), but in wealthy urban areas where wholesome food is replaced by convenience food. Dieting may limit the required amout of thiamine required by the body. Thiamine is associated with peripheral nerve conduction. A deficiency causes irritability, weight loss, decreased concentration, anxiety, depression and noise sensitivity (Franzen & Berg, 1998).

The positive effects of breastfeeding, using baby milk formulas which contain docosahexanoic acid (DHA) or supplementation with long-chain polyunsaturates like evening primrose oil or fish oil to improve neurotransmission have been demonstrated by Lucas (1998). DHA is a cognitively beneficial nutrient factor found in breast milk. Preterm infants fed on breast milk showed an improved psychomotor development index on the Bayley Scales at 18 months.

2.3.2.12 No known etiology

In some cases of developmental delay, there is no known cause. For example, although there is no known cause in some cases of autism, the atypical way autistic children interact or avoid interaction with others and their environment place them at risk for development (Volkmar, Lord, Bailey, Schultz & Klin, 2004; Wilson, 1998).

2.3.2.13 Educational reasons

A barrier to education which gives rise to developmental delays in children is inadequate preschool facilities. Many children do not have access to any preschool let alone quality preschool education. Donald, Lazarus and Lolwana (2002) regard inaccessible or unsafe schooling environments as a barrier to learning.

2.4 Chapter conclusion

This chapter has presented a survey of the literature on theories of development, normal neural, cognitive, speech and motor development of a child and the concept of school readiness. A definition of a developmental delay was followed by a review of the etiology of developmental delays. The effects of developmental delay vary according to the child's stage of development, and subsequent development may be affected negatively.

In order to develop a programme of intervention for children with delayed development, it is necessary to draw from this body of knowledge.

Chapter three examines the legislation, rationale for and approaches to interventions, the history of interventions and multidisciplinary interventions currently used to enable at risk children to actualise their potential.

CHAPTER THREE

MULTIDISCIPLINARY INTERVENTIONS

Chapter two presented a review of the literature regarding child development and developmental delays. Normal development led to discussions on school readiness and developmental delays. The chapter concluded by listing causes of developmental delays, in the light of these being either congenital, preventable and/or ameliorable.

This chapter explores the field of multidisciplinary interventions which are intended to reduce the effects of delays in the development of the child. The principle that some developmental delays can be treated so that the child can better achieve his potential is the subject that is to be explored in this chapter. This chapter presents the legislation governing the intervention of children, the rationale for intervening and general approaches to intervention. A brief history and goals of intervention follow. Examples of international and local intervention research are cited. This section continues with a comprehensive discussion on multidisciplinary interventions from educational, medical, speech and language, physiotherapy, occupational therapy and psychological perspectives. The chapter ends with a conclusion.

Intervention may be defined as a systematic attempt to alter the course of development from its predicted path, or from an established path. An intervention is not a standardised, quantifiable process but an individualised programme for each person with a particular impairment (Clarke & Clarke, 2003).

3.1 LEGISLATION

Legislation provides the context in which intervention can take place. The passage of Public Law (PL) 99-467, Education for the Handicapped Act Amendments of 1986, in the USA, provides for the education of handicapped children from birth to six years. The eligible population includes children with developmental delays, those who have been diagnosed with a physical or mental condition that has a high probability of resulting in developmental delay, and children who are at risk of delay if early intervention services are not provided (McLinden & Prasse, 1991).

Since 1975 children with disabilities have been entitled to be enrolled at public schools through PL 94-142. This legislation was expanded upon in 1990 to ensure that any child enrolled in public education with a disability was assured of receiving all necessary help. PL 101-476 heralded inclusive education in the USA (Sands, Kozleski & French, 2000).

Similar legislation in the United Kingdom exists in the form of Part III of the Education Act of 1993 (incorporated into the 1996 Education Act, Part 4) addressing children with special educational needs. Local education authorities are responsible for identifying, assessing and providing for these children's needs as early as possible (even before two years) within an inclusive setting (Mittler, 2000; Wilson, 1998).

Educational policy in South Africa endorses support for children who suffer barriers to learning (Department of Education, 1997). Children are entitled to receive an appropriate education in the least restrictive environment. Children with special needs are accommodated in the regular schooling system and are to receive extra support where necessary. That all children are educated together with the aim of minimising differences is consistent with the principles of inclusive education. Children have a right to be treated as normally as possible. Although the policies exist, in the light of transformation and a paradigm shift from the past to a constructivist approach, putting these policies into practice has not yet taken place (Donald, Lazarus & Lolwana, 2002).

Outcomes-based education fosters learning by connecting familiar and new content and process through guided discovery and co-operative group learning. Language as the medium of education is developed and encouraged all the time. Research by Ramirez in 1991 as cited in Donald, Lazarus and Lolwana (2002) has initiated changes in educational policy from the previous system where some children were taught solely through the medium of a second language from the third grade. Ramirez (Donald, Lazarus & Lolwana, 2002) demonstrated that the longer the first language is actively taught parallel to a second language, the better is a student's general scholastic performance, including performance in the second language. Equal status needs to be accorded to all languages and positive, encouraging attitudes in language teaching are recommended (Donald, Lazarus & Lolwana, 2002).

Educational policy seeks ways to optimise the learning potential of children. When children are at a disadvantage, some kind of intervention can provide the support they need. The reasons for early intervention follow.

3.2 RATIONALE FOR INTERVENTIONS

A rationale for early intervention for young children at risk lies in the fact that initial patterns of learning and behaviour that influence all later development are established during the early years. Research has shown certain critical periods when the child is more susceptible and responsive to early learning experiences (Guralnick, 1998).

Intelligence and other human capacities are not fixed at birth but can be shaped by environmental factors and learning. Conditions which handicap a child do not only interfere with development, but become more disabling when not addressed. The realization of potential of a child depends on the quality of a child's early experiences and learning. A depriving background will limit a child and a nurturing environment will benefit the child. It has been shown that early intervention programmes are more successful in helping a child than later remedial assistance at primary or high school level (McCormick & Hickson, 1996). Socio-economic benefits are realised when difficulties can be dealt with earlier rather than later when these become more intractable. Parents need professional help to help a child at risk to ensure that basic skills are established during the critical early years.

Grafman and Salazar (1995) maintain that support for intervention emerges from the field of neuropsychology. Studies have shown that compensatory strategies acquired during stimulation, may lead to a different neural network becoming responsible for a task. Although this network may not be the most effective, it may allow for improvement in

functional abilities. Relocalisation of function occurs more successfully in children than adults. For example, Temple (1997) reports that the potential of the right hemisphere to take over language function, which was once seated in the left hemisphere can occur. Relocalisation has been shown in cases of injury prior to the age of five or six years whereas adults are often left with severe and pervasive aphasias (Temple, 1997).

This plasticity enables the development of compensatory effects. Compensation occurs when neuropsychological disorders are acquired as a result of postnatal lesions or as a response to injury or disease, rather than to an abnormal developmental process as in developmental disorders. Limits to plasticity may be as a result of some cognitive systems which may be preformed, either genetically or physiologically, before the particular system is functional (Temple, 1997).

According to Fletcher et al. (1995) the effects of multidisciplinary interventions after the subacute phase of head injury are largely unknown. They urge for studies of intervention to be designed, but acknowledge the variables that need to be considered and the ethics of not offering intervention to certain subjects, complicate design.

As already mentioned, further justification for early intervention is that the state benefits economically in the long-term as there are fewer demands on educational and other resources later on (McCormick & Hickson, 1996).

Further proof of the benefit of early intervention is to show the extent to which children recover partly or fully from developmental delays. This proof can be gleaned from all the positive findings documented in the sections on the history of interventions and present research findings.

Early remediation can be motivated from a psychological perspective. The psychological effects of being disadvantaged were emphasized in Horne's (1985) classical study. It was found that children with general delays, specific learning difficulties, specific language impairments, hearing impairments and physical disabilities experience peer rejection which exacerbates their difficulties.

Sigman and Ruskin (1999) performed a longitudinal study in which they examined the continuity and change in diagnosis, intelligence and language skills in 70 children with autism, 93 children with Down syndrome, 59 children with developmental delays and 108 typically developing children. The longterm follow-up showed little change in the diagnosis of autism and Down syndrome, no change in the intelligence of children with autism, developmental delays and the typically developing children but a significant decline in the intelligence of children with Down syndrome. The children with autism and Down syndrome did not differ from each other in the extent of change in their language ages but the children with developmental delays gained more over the same period.

Intervention programmes are focused primarily in the early years of life and taper off as children enter the mid-school years. Even though early intervention typically yields short-term advantages, the effects should not be undervalued. Although Clarke and Clarke (2003) have observed that cognitive increments often follow after termination of a programme, Sigman and Ruskin (1999) believe that some of the declines noted in some of

the children in their longitudinal study might have been prevented with the maintenance of intervention.

General approaches to intervention are explored in the next section.

3.3 GENERAL APPROACHES TO INTERVENTION

Traditionally, different approaches to intervention have been needs-driven where intervention is offered to remediate specific deficits.

Before the 1960s, intervention was based on stimulating cognitive, perceptual-motor or academic skills usually in small groups by a teacher, speech therapist, physiotherapist or occupational therapist. The importance of parents and the home environment in the offering of support was emphasised. Parental involvement remains an important variable for the success of any educational programme. Familial and unfolding genetic and psychosocial influences are more important for long-term outcome than brief interventions themselves (Clarke & Clarke, 2003; Short, 1987).

Current programmes are based on the separate or eclectic combination of behavioural, normal developmental, cognitive developmental and cognitive learning models. The behavioural model draws from Skinnerian (1974) principles. The normal developmental model is based on Dewey's (1902) child-friendly ways of educating children. The cognitive developmental model originates in Piagetian (1963) thinking. The cognitive learning model described in Bender and Bender (1979) views the child as a dynamic learner. This model incorporates cognitive, psycho-linguistic and perceptual theories to determine the child's level of functioning and provide stimulation should there be aspects below par.

Snow, Burns and Griffin (1998) report on conclusions from current research which suggest that better overall achievement results from more developmental approaches where content learning is embedded in the child's play or self-directed activities.

Haywood, Brooks and Burns (1991) compared the effects of different models of intervention on preschool children. The different models of direct instruction with academic skills as content, teacher-directed language instruction, and mediated instruction with cognitive strategies as content were compared. The direct instruction group showed significantly higher performance on two tests of language development. The mediated instruction group had significantly higher verbal and memory scores, and increased mean length of utterances on language scores. Initial follow-up favoured the mediated instruction group. Follow-up at nine years of age demonstrated an interaction between the kind of treatment and their ability. Children who had higher general cognitive ability before the preschool intervention achieved higher results from direct instruction. Children with lower cognitive ability prior to intervention showed better gains from mediated instruction (Snow, Burns & Griffin, 1998).

Where resources are sufficient, needs-driven approaches succeed in remediating deficits. Where resources are limited as in some communities, an asset-based approach to early intervention may be the only solution. Kriek and Eloff (2004) have demonstrated the success of this approach using a case study. In an asset-based approach the community

collaborates to harbour all assets which can be used to solve the problem. Traditional approaches take the lead in providing the intervention and an asset-based approach empowers the community to take the lead. Asset-based intervention requires a shift in the perspective of a professional from a top-down direction of the process to a bottom-up networking in a community to enable the process (Eloff & Ebersohn, 2001; Kriek & Eloff, 2004).

Intervention to enhance cognitive functioning has shown positive results but a systems approach in which parents are enlightened regarding their role and operating educational factors are considered to show better value (Green, 1996).

Many examples of successful intervention programmes exist in the literature, irrespective of the underlying model. The history of intervention programmes until the present day is noted in the next section.

3.4 HISTORY OF INTERVENTIONS

The history of interventions can be traced back to the 17 th century when programmes with noble aims of improving the lot of children were first initiated.

3.4.1 Early history of interventions

Two of the first contributors to compensatory education were John Locke and Robert Owen. John Locke's (1632-1704) philosophical concept of tabula rasa is based on the belief that what children learn is a direct result of their experiences, activities and environment especially in the early years. He initiated programmes for children living in poverty. Robert Owen (1771-1858), a manager of a textile mill, prohibited young children from working during a time when this was regarded as normal, and restricted working hours for older children. He established a school where children were taught scholastic and creative skills (Wilson, 1998).

Jean-Jacques Rousseau (1712-1788) changed the perception of children being treated like adults to them being viewed as moving through a succession of stages and learning through interaction with the world (Williams, 1999).

Rousseau's thinking influenced Johann Pestalozzi (1746-1847) and he introduced the tutor system where older children guided younger children in collecting, drawing, classifying and elementary mathematics (Williams, 1999).

Self-actualisation was introduced as the goal of education by Friedrich Froebel (1782-1852). He was the first educationalist to design a curriculum in which specially designed teaching materials to promote particular kinds of learning were included and where teachers were expected to ask questions, give suggestions, coach and prompt (Williams, 1999).

Maria Montessori (1870-1952) challenged the paradigm of working with mentally retarded children within the medical model to one where practical self-help tasks, sensory awareness and scholastic skills were taught. The Montessori programme introduced a

modern-day focus on the individual within a modifiable curriculum (Montessori, 1964; Wilson, 1998).

Montessori (1964) observed that children pass through sensitive periods of development where certain skills or concepts are learned more readily (not unlike Piaget). She believed that learning takes place spontaneously in an environment where activities based on sequential stages have been planned. She has been criticised that her method does not offer enough opportunity for spontaneous incidental learning, language development or development of symbolic thought (Curtis, 1986).

The first half of the twentieth century witnessed John Dewey's (1859-1952) ideas being introduced into the curriculum. He put forward the concept of a child being prepared for society by being encouraged to discuss problems with adults to ameliorate his transition (Seefeldt, 1999).

In 1919 Margaret McMillan wrote about the interconnectedness of the home and community as contributors to the education of the child (long before Bronfenbremmer in 1979). The concept of the nursery school as an extension of, but not substitution for the home remains a principle of nursery education. She recommended extension of children, stimulation of imagination through stories and rhyme, and sensory training by playing in the garden (Curtis, 1986).

The first documented study on early intervention took place in 1939 by Skeels and Dye (McCormick & Hickson, 1996). Half the number of infants in an orphanage were placed with substitute mothers and the other half were left in the institution. Children in the experimental group showed a 27,5 IQ point gain and even more remarkable effects were noted when this group was followed into adulthood. Criticism was raised questioning the reliability of the data and that the control group did not receive compensatory treatment (McCormick & Hickson, 1996). According to Clarke and Clarke (2003) the data was unreliable as the standardization of the Stanford-Binet in 1916 had underestimated the IQs of adults.

Although similar studies with similar positive results continued, research resumed in earnest after the First and Second World Wars. This research is documented in the next section.

3.4.2 Present research findings

Present research findings are detailed in this section.

The research company of Littlejohn and Associates evaluated the outcomes of 280 projects funded by the Handicapped Children's Early Education Programme in the USA. Positive developmental outcomes were reported, with 55 percent of children who had received early intervention being educated in mainstream settings (Peterson, 1987). On the contrary, Buysse and Bailey (1993) reported on 22 studies which they evaluated. They concluded that irrespective of the developmental domains assessed, no differences were found to result from children's participation in inclusive or specialised programmes.

The Perry Preschool Project in Ypsilanti, Michigan, USA showed that fewer special education services were needed by participants who received early intervention (McCormick & Hickson, 1996). The study began in 1962 and is now in long-term follow-up. The experimental group received two years of preschool education based on the developmental model with weekly visits to their homes while the control group received neither. These and all subsequent groups have been compared annually and have shown that the experimental groups achieved higher educational levels, more stable employment, lower birth rate, less criminality and fewer have needed public assistance (Weikart, 1989). According to Clarke and Clarke (2003) the involvement of the mothers and chain of transactional events was notable. The young people had been supported through childhood and adolescence.

The most recent positive findings supporting early intervention emerge from a review of 74 studies done in the USA by Utah State University (McCormick & Hickson, 1996). Two of these interventions namely, Head Start and the Cognitive Curriculum for Young Children, are discussed below.

Head Start is a comprehensive current child development and family support programme. It was initiated across the whole of the USA in 1965 with the overall goal being to bring about a greater degree of social competence in children from low-income families. To achieve this goal the programme was devised around the four component areas of educational services, health services, social services, and parent involvement. The educational component focusses on the acquisition of specific content to prevent children from disadvantaged backgrounds from failing. Health services provide medical treatment, nutritious meals, and immunisation. Social services involve more efficient and responsive welfare support to the poor. The parent involvement component offers parents parent enrichment courses, an opportunity in decision-making, and participation in the classroom. By 1995 13 million children had received the intervention. In the 1980s 1,600 documents researching Head Start were reviewed and were unanimous in confirming the all-round positive effects on the children and their communities (Washington & Bailey, 1995; Williams, 1999).

Clarke and Clarke (2003) report contradictory findings based on numerous studies on the Head Start program. They conclude that if preschool intervention is not reinforced by further and ongoing environmental improvement, the personal and social problems of the disadvantaged cannot be solved, one of many negative findings reported. Niesslein's (2003) criticism of Head Start is that the programme only reaches 60% of the target population. This has resulted in a re-analysis of the programme.

The Cognitive Curriculum for Young Children was designed for children from three to six years who are handicapped or at risk for learning. This programme is narrower in its focus on cognitive development. It was developed by educators and psychologists to teach children how to perceive, think, learn and problem-solve. Intelligence Quotient (IQ) gain, positive changes in teacher and pupil behaviours and greater probability of placement in regular classes were shown to be the positive consequences (Haywood, Brooks & Burns, 1991).

Studies by Bagnato and Neisworth in 1985 and 1989 (Guralnick, 1997b) have attributed significant gains in developmental and behavioural skills in two groups of brain-damaged

preschool children to an interdisciplinary intervention programme. The one group had congenital brain damage and the other acquired brain damage. Gains exceeded the changes which could have been attributed to maturation alone.

Recent international debate centres around the provision of full-day schooling for preschoolers. Regarding the curriculum some educationalists feel that school skills and subjects should be presented to accelerate learning. Others feel that development for problem solving and thinking skills are more important (Williams, 1999).

In France, Germany, Italy, USA, and South Africa, intervention programmes have historically been provided for select seriously handicapped groups of children (McCormick & Hickson, 1996). Since the 1950s countries which regard education as a high priority and can support these ideals economically have extended educational services to all disabled preschool children. Countries such as Sweden, Italy, France, and Germany have widened service delivery to include all preschoolers with special attention given to children with special needs (McCormick & Hickson, 1996).

From a general perspective, Morrison (1987) performed a comparative study between groups of preschoolers who had attended preschool and those who had not. In his Rand Mines Education Project he confirmed that children who attended preschool benefitted in their grade one year. Karweit (1994) however, has argued that a year of preschool will not have sufficient impact to prevent learning problems from developing and that sustained intervention in children who show themselves at risk is necessary.

A few local studies on the subject of preschool educational intervention are cited below. Kay (1979) confirmed the efficacy of a motor programme on the scholastic progress of children in the Aid (remedial) classes. She used a Solomon four-group design in which the experimental groups were compared with the control groups on academic achievement, cognitive ability, self-image and ego strength. The experimental groups showed an increase in academic achievement and self-image, confirmed by objective teacher rating scales.

Houston-McMillan (1988) showed a gain in scores on the Griffiths Scales after an intensive input with a group of mentally handicapped children. The intervention was multidisciplinary over a two year period. There was an increase after the first year and a greater increase at the end of the second year. Although a definite increase in scores was noted, the fact that there were no controls was a methodological flaw in the study.

Cloete and Kok's (1988) structured programme produced positive results on a small group of children where learning problems had already manifested. The programme focussed on physical growth, sensory integration, motor development, visual skills, language development, body image and laterality, auditory perception, visual perception and cognitive skills. The programme consisted of 21 sessions of 30 to 35 minutes each over seven to eight weeks for groups of two to six pupils. Twenty-one children were in the experimental group and twenty-two were matched controls. The combined group of boys and girls showed improvement in visual-perceptual-motor ability. The boys did not show any improvement. Girls improved with regard to all domains except the auditory-perception, language and social-emotional domains. They concluded that the focus on

remediation after the identification of learning problems should change to a more preventative practice of remediating difficulties before they present as learning problems.

Herbst (1989) found that environmentally-disadvantaged children who were stimulated improved their levels of school readiness. She designed her own stimulation programme and trained the teachers to implement it. A two by two factorial design was used to investigate the influence of two independent variables, the stimulation programme and purchased educational toys on two levels of the dependent variables, namely the toddlers' cognitive and motor development. The results indicated that both independent variables had significant influences on the two dependent variables. However, the interaction effect of the combination of the stimulation programme and the toys had no significant influence on the dependent variables. The programme was implemented over a four month period.

Grobler (1993) evaluated a home-based, parent-orientated preschool programme from the parents' perceptions. He used an Israeli preschool programme which met with positive parental feedback in terms of the children's positive attitudes to the programme and the enhancement of parent-child relationships.

Positive results were obtained by Behr (1997) in a community-based rehabilitation programme in which parents and teachers were trained in physiotherapy interventions to develop the functional abilities of children in their care. Half the children showed a significant improvement in their gross-motor development. A weekly meeting of the researcher and caregivers was held to teach them how to include the physiotherapy interventions in daily home care. She used qualitative research methods to assess the improvement in the caregivers' knowledge and understanding of the impairments in the children. The Test of Gross Motor Development was used to evaluate the programme's efficacy in a quantitative way.

Briedenhann (1998) reported that five children showed an improvement in gross-motor skill level while six did not after an intervention programme. The children received the programme twice weekly for eight weeks. Each session lasted 30 to 45 minutes.

Herbst and Huysamen (2000) have developed and validated a set of developmental scales for environmentally-disadvantaged preschool children. As no other surveyed instrument was found appropriate, the Herbst Scales were designed to be culture-fair and child-friendly. The goal of the Scales is to identify cognitive and motor problems associated with poor scholastic progress with a view to stimulation to enhance later school learning for these children. It was found that developmentally stimulated children performed substantially better than unstimulated children confirming the Scales's construct validity.

This review on the history of intervention programmes and more recent findings provides a background to intervention and confirms the value of intervention in children with delayed development. The aims of intervention are outlined in the next section.

3.5 GOALS OF INTERVENTION

The following goals for intervention with young children with disabilities have been recommended by Peterson (1987):

- To provide an educational environment or adapt existing ones so that the child is not penalised for having a disability. Learning opportunities must be brought to the child as the child is unable to seek these out for himself.
- To teach the child skills to compensate for the disability and help overcome some of the limitations.
- To provide other avenues of learning by using special materials, adaptive equipment, teaching techniques and prosthetic devices to circumvent limitations caused by the disability.
- To teach developmental and adaptive skills to enable independence and competence so that the child can function in the mainstream, achieve a sense of self-mastery and develop a positive self-image.

Dockrell and Messer (1999) and Salisbury and Smith (1993) add that effective intervention will have as one of its aims the generalisation of a newly learnt skill in therapy to other situations. A way to ensure transfer of newly acquired skills is that the usefulness of a particular skill needs to be comprehended by the child. The new skill should show improved performance on related tasks. One would attempt to teach the child metacognition, an awareness of one's own thinking.

This section has listed the goals of intervention, the main one being an attempt to help the child overcome his difficulty and actualise his potential. The next section describes multidisciplinary interventions which can assist the child with delayed development from various perspectives.

3.6 CURRENT MULTIDISCIPLINARY INTERVENTIONS

In this section multidisciplinary interventions for children with delayed development will be explored. Educational, medical, speech and language, occupational, physiotherapy and psychological interventions are discussed. Educational interventions introduce this section.

3.6.1 Educational interventions

This section discusses different curriculum models that have different effects on how children learn; how children with delays benefit from certain teaching methods; that literacy in children can be improved by utilizing research findings; remedial education as many children with delays require this kind of intervention; the teaching of thinking skills and programmes which can be used for teaching thinking skills.

In order to remediate delays in children by teaching, it is necessary to review curriculum models and debate the merits of the different approaches.

3.6.1.1 Curriculum models

Curriculum models are linked to the various theories underlying beliefs about how children grow and develop. Recent models tend to emphasise developmental milestones or the acquisition of functional skills to prepare the child for future demands. The curriculum is regarded as the entire set of experiences including the programme, teacher-child ratio,

group size, degree of structure, teaching activities, the physical environment and peers. Curricula can be adult- or child-centred (Bailey, 1997).

Preschool teachers in the United Kingdom (UK) have opted for a more child-centred than content-driven curriculum with intervals of direct instruction at different times of the day (Anning, 1991).

Katz (1999b) proposes a different approach in terms of how she views curricula. She regards curricula from an instructivist or a constructivist perspective. The instructivist or academic perspective regards the child as dependent on the adult's instruction. This approach has grown in popularity to serve the downward pressure of curriculum expectations from older to younger children. The constructivist approach is in direct contrast to the academic approach as children are seen as active constructors of knowledge where opportunities for learning are provided.

Comparative studies between constructivist and instructivist approaches yield mixed results although children schooled within the constructivist perspective fare better long-term, especially the boys. Curricula gains of children from the instructivist perspective do not last more than a year or two and the child's disposition to learn appears to be affected negatively. With academic tasks that need to be taught in most cases, the child is placed in a passive-receptive role and performance is emphasised over the enjoyment of a positive learning experience (Katz, 1999b).

Wilson (1998) recommends a competency-based approach to intervention. The child is viewed from a position of being able to construct his own knowledge with his individual strengths and areas of need. The challenge for the teacher is to facilitate the way that a child learns best. Competence and confidence are maximised and the child's disability is minimised. Early intervention promotes the child's confidence and avoids secondary handicaps for example social deficits and/or emotional difficulties.

Katz (1999b) recommends the use of project work that provides the context for both the constructivist and instructivist perspectives. A positive disposition to learning can be encouraged through constructive play while at the same time, opportunities for formal instruction can be utilised.

Although many educationalists recommend direct instruction, Nutbrown (1994) agrees with Froebel, Montessori, Pestalozzi and MacMillan in their regard of the significance of children's play in the learning process. She observed that children explore many mathematical and scientific ideas on their own.

Katz (1999a) examines what children should learn. She reminds one to bear in mind the abilities and limitations of a child at a particular age and the influence of time and experience on learning. She questions whether the teaching of phonics on a preschool level is justified because some children understand the concept. She answers by confirming the edge the constructivist perspective has and that teaching a child with a positive disposition is rewarding (Katz, 1999b).

Lowery (1991) states that the curriculum and instruction reflect the stages in which thinking develops. He suggests a horizontal curriculum where children are challenged to

use a particular stage of thinking with different materials at various levels of abstraction. A student's progress should not be compared with other students but against himself within his particular stage of thinking. Lowery (1991) puts forward the idea that the current vertical schemes cause fears of failure and poor self-worth.

Weikart, Epstein, Schweinhart and Bond (1978) report on the equivalent effectiveness of cognitive, language or child-centred curriculum approaches. The effect of these approaches on the development of cognitive ability even after school led the researchers to the conclusion that it was not only the content of the programmes that benefitted the culturally deprived children but the interest, commitment and problem-solving skills of the teachers (Margolin, 1976).

Curtis (1986) scrutinised different nursery education programmes. Common features included the participation of parents, the fostering of sound human relationships, a balance between child-directed and teacher-directed activities, a curriculum with specific objectives, geared to individual needs and where education is fun. Curtis, an education consultant, feels that "nursery education is about challenging children and encouraging them to develop into motivated learners and thinkers, full of curiosity about the world around them" (p.3).

Salisbury and Smith (1993) stress the value of parent involvement in contributing to an effective intervention. In addition, they emphasise that intervention should occur early in the child's life, operate from a more structured and systematic instructional base, address the child's needs and include normally developing children as models.

Learning is based on engaging children in informal play. Certain parts of the day are structured learning situations. Social learning forms part of the curriculum. The teacher needs to be positive and warm to the children. Programmes achieving cognitive gains emphasised small group interaction and a positive attitude of the teacher (Weikart et al., 1978).

Curtis (1986) recommends the curriculum to develop skills and competencies in self-awareness, social skills, cultural awareness, communication skills, perceptual-motor skills and creative and aesthetic awareness (Curtis, 1986).

The curriculum for young children in the UK includes the following eight areas: linguistics and literarature, mathematics, aesthetics and creativity, physical development, science and technology, morality, spirituality, and humanity and the social sphere (Anning, 1991).

Nutbrown (1994) emphasises the roles of pattern and consistency in children's development. Consistency needs to be reflected in the adults close to the children and their behaviour, routines and information, and experiences and materials. Children will learn if they have a sense of security in a consistent environment that surrounds them.

Irrespective of the curriculum models, all contribute to improved learning. Research by Bailey (1997) has shown consistently that adult-child ratios, group size, qualifications and training of the staff are important indicators of any programme quality (Bailey, 1997).

How curriculum models influence the learning of children have been explored. Certain instructional behaviours can enhance the learning ability of children. The effects of different teaching methods on children and their learning are described in the next section.

3.6.1.2 Learning environment

Because young children's readiness to learn is influenced by their unique background experiences and because they have not been socialised educationally yet, Katz (1999a) recommends a variety of teaching methods.

Research has identified that certain instructional behaviours of teachers enhance the intellectual development of children. These include the creation of opportunities for thinking; the structuring of the classroom to elicit individual, small-group, or total-group active thinking; a teacher's directions and questions which engage children to find out, recall or transfer of learning; a teacher's responses which motivate, extend and enable metacognition; the focussing on and labelling of strategies used in thinking and the teacher's modelling of thinking behaviour as an example to the children (Costa & Lowery, 1989).

The way a teacher structures questions and statements can improve children's thinking skills. Costa and Lowery (1989) suggest that questions be asked to stimulate the children to use their senses to collect information. Recall can be encouraged by questions eliciting naming, describing or remembering. Processing of information can be fostered by questions and statements which encourage drawing cause-and-effect relationships, synthesising, analysing, summarising, comparing, or classifying. Use, application and transfer of the new learning can be stimulated by speculating, generalising, evaluating, judging, hypothesising and inferring (Costa & Lowery, 1989).

More important, Costa and Lowery (1989) view the teacher's responses as having a greater influence on the development of the children's self-concepts, their attitudes to learning, their achievements, and their rapport than the actual learning content. Open-type responses necessitate listening on the part of teachers and contribute to a warm learning environment. They recommend the use of reflective rather than impulsive thinking. Acceptance rather than condemnation of children's ideas shows understanding. Clarifying and probing responses encourage creativity and further investigation. Praise is motivating in young children until they are about seven or eight years of age. Praise can have a negative effect on older children as research by Deci and Ryan (1985) suggests as they become dependent on others for their worth rather than upon themselves.

Learning improves when children are aware of the aim of the lesson, when time is used efficiently, when directions are clear, where classrooms are congenial and orderly and children are engaged in a meaningful learning task (Costa & Lowery, 1989).

In this section the effect of teaching methods on children and their learning have been explored. Literacy interventions are discussed in the next section.

3.6.1.3 Literacy

Prior to the 1960s it was believed that children needed to attain certain maturational tasks such as auditory discrimination, left-to-right eye progression before being able to learn to read. Now literacy is regarded as starting after birth. Listening to stories, discussing stories, scribbling letters to family and friends are regarded as ways of developing emergent literacy. Interaction and mediation contribute. Research has shown that many of these skills can be acquired while learning to read (Gambrell & Mazzoni, 1999).

Notari-Syverson, Maddox and Cole (1998) suggest in their training manual that parents be taught how to stimulate their children's language. They put forward a CAR acronym for comment and wait, ask questions and wait and after the child has responded, respond by adding more.

At the preschool level, Cook (1997) maintains that letters and numerals and the idea of working from left to right be taught. More attention should be paid to drawing. Attention should be focussed on teaching the child to listen to directions. Narrative skills need to be encouraged so that when simple sentences are expected in the first grade the child will be able and keen (Cook, 1997).

Valtin (1979) evaluated completed research and confirmed that difficulties in learning to read correlated with a lack of language awareness (especially that of phonemes). Language awareness can be improved by the language stimulation the child receives from home and school.

Beyers (1983), Gambrell and Mazzoni (1999) and Snow, Burns and Griffin (1998) re-iterate that language awareness is an important aspect of the preschool curriculum as it correlates highly with learning to read. Beyers (1983) explains that this concept is like metacognition where the child knows that he knows. Language awareness is a cognitive process of which one aspect is phonemic segmentation. The child must not only be taught that graphemes represent phonemes, but the functions of these in words, and the visual, phonetic and articulatory aspects of the letters in a word. Preschool teaching needs to introduce the fact that one grapheme can have two phonemes, and that a number of phonemes can be represented by two or three graphemes.

Apart from the fact that reading achievement is related to the availablity of reading material in the home, Grigorenko (2001) confirms Beyers's (1983) belief that the central deficit experienced by poor readers is related to phonological processing. Wasik (2001) has found that one of the best predictors of success in first grade reading is knowledge of the alphabet. A further impediment is the lack of ability to automatise, also noted by Gambrell and Mazzoni (1999).

Notari-Syverson et al. (1998) recommend that children learn to understand the connection between print and the spoken word. Pretend reading and writing is suggested. Children should be exposed to different kinds of environmental print for example, traffic signs, logos, and product labels.

Mountain (2000) maintains that because language is the basis of all learning, the language of the "3Rs" is the starting point for preparing children to read, write and do arithmetic. He suggests stimulation of vocabulary that has to do with reading, writing and arithmetic. The concepts of size, shape, quantity, measurement (weight, height), and counting need to be taught in practical ways. He also suggests the use of CD-ROMs to teach letter and number recognition, counting and phonics.

A study by Wright and Huston in 1995 as cited in Snow, Burns and Griffin (1998) has shown that children who watched Sesame Street at an early age had an advantage in vocabulary, letter and word recognition, school readiness, and better reading comprehension scores in first and second grade than children who had been less frequent viewers (Snow, Burns & Griffin, 1998).

Counting books, learning to tell the time, measuring, and sorting are skills Mountain (2000) recommends be taught. The concepts of addition, subtraction, sharing (division) and multiplication can be explained to the children. He advocates the use of games in learning numerical skills. Guess-timating is a skill which enhances counting and measuring ability.

Campbell (1999) adds that the child needs to construct a meaning of the relationship of numbers to other numbers. For example, 5 is 2 plus 3, 1 more than 4, a lot less than 30, only a little less than 7, as many fingers on one hand, with 5 more 10 altogether. Incorporation of geometry will teach spatial sense.

Landry and Forman (1999) advocate the teaching of scientific thinking by shifting the child's passive acceptance of a fact to a questioning of it. Children need to be taught to observe what happened and arrive at an explanation for the event. Mediating children to ask more questions in leading them to the answers and encouraging children to search for reasons underpins the teaching of philosophy encouraged by Costello (2000).

Because music has been shown to aid memory, Ling (Estabrooks & Birkenshaw-Fleming, 1994) suggests the use of stories and verse learned within a musical context. Rhythms in song can have a positive effect on learning normal rhythmic speech.

This section has described how educational interventions contribute to scholastic learning. Remedial education will be discussed in the next section.

3.6.1.4 Remedial education

Horton (1994) puts forward two schools of thought regarding remedial education. The first one, to remediate the deficit, has been used for over 20 years and the second, currently better regarded, aims to utilise the strengths to compensate for the deficits.

Although the inclusion of special education teaching strategies are of use in an inclusive setting, Widerstrom (1986) suggests four regular early childhood educational strategies that will serve children with special needs. He recommends group work that encourages peer interaction, free play, indirect (as opposed to the highly directive teaching methods of days of yore) and reactive teaching, and lessening teacher control. He advocates the

working together of teachers with a transdisciplinary team. He stresses the inclusion of the family in all decisions as this supports the whole process (Sands, Kozleski & French, 2000).
Burstein, Sears, Wilcoxon, Cabello and Spagna (2004) studied schools in two school districts in California where inclusion had been implemented. The above mentioned strategies were observed and a positive outcome was reported by teachers and children. One gain was that special education teachers became more involved with all the children. However the study can be criticized as academic results were not researched in investigating the effects of remedation within an inclusive setting.

Wilson (1998) reminds one to view the child with an impairment from a developmental rather than a deficit point of view. Children with special needs are children first. On a neurological or maturational level she points out that appropriate objectives must be aimed for.

She introduces a word of caution so as not to teach "learned helplessness" and limit assistance to children with special needs rather encouraging them to create their own solutions to difficulties they experience (Wilson, 1998).

The primary defining risk factors that separate different at risk groups of children affect the design of a curriculum from being broad-based across development or specific in its focus. For example, children with a visual or hearing impairment often experience delays in other areas of their development (cognitive, socially as they cannot read body language, motor difficulties). It is important to design a curriculum which can address all these aspects (Wilson, 1998).

Kruger, Kruger, Hugo and Campbell (2001) reported research results which highlight the integration of problem areas that some children experience. They selected 19 children of mixed gender and grouped them according to their problems. They identified children sharing visual and auditory difficulties as well as problems with motor and concentration difficulties. Their results bore witness to the neurophysiological integration of sensory and motor systems, which weigh heavily in the development of academic success. This study is notable as it is focused across multidisciplinary areas of expertise and did not fragment the difficulties which children often experience together.

Kriegler and Farman (1996) advocate prevention programmes in the form of the existing Panels for Identification, Diagnosis and Assistance (the PIDA system) through the primary health care system provided on a six-weekly basis at certain schools in South Africa.

Remedial education can improve the abilities of children with scholastic difficulties. The teaching of thinking skills is introduced in the next section.

3.6.1.5 Thinking skills

Research by Hacker (1998) has shown that even preschool children can monitor their knowledge of their knowledge and thought processes. English (1991) has shown that young children are able to combine informal problem-solving processes with their existing knowledge structures to solve a novel task, provided the context is meaningful. As they learn more within a particular task domain, they are able to modify problem-solving

processes. Children need to be exposed to novel problem-solving situations which are conducive to the discovery of knowledge and application of higher-order thinking processes, rather than the mechanical application of rules or procedures.

The teaching of thinking skills not only supports the slower learners but allows the faster learners to develop the skills needed for learning in individual and group contexts (Wallace, 2001).

Research has shown that when thinking skills become part of a curriculum, academic results improve (Costa & Lowery, 1989; Wallace, 2001).

Edwards (1991) acknowledges that there appears to be an acceptance of teaching thinking skills, but indecision on how to execute the idea. Some educationalists advocate the embedding of thinking skills into the existing curriculum, while others feel that thinking skills should be taught as a separate discipline. He and Wallace (2001) conclude by stating that although specific thinking skills programmes exist, for long-term benefits these learnt skills need to be practised through existing academic disciplines.

Polson and Jeffries (Edwards, 1991) caution that information-processing theories of learning and skill acquisition have not progressed to the point where definitive statements on how to instruct thinking can be made. On the grounds of educational research, they speculate that all programmes need cognitive objectives, that metacognition is effective in problem-solving, and that executive processing manages the whole process and that new skills are learnt with practice.

Costa and Lowery (1989) and Costello (2000) believe that the language teachers use, should encourage thinking. Opportunities to link thought and language need to be sought by utilising specific thinking-skill labels and instructing children in how to use them. They propose the use of words such as compare, predict, classify, analyse, conclude rather than a description of the process to stimulate an awareness of their own thinking (metacognition) and express their inner thoughts aloud.

Programmes for the teaching of thinking skills are covered in the next section.

3.6.1.6 Programmes for the teaching of thinking skills

This section deals with the teaching of problem-solving, metacognition, programmes for the teaching of thinking skills and the role of emotional intelligence in intervention programmes.

Problem-solving and metacognition are the two foundation skills which underpin thinking skills programmes, in the past and at present (Wallace, 2001).

Effective problem solving can be taught as a five stage process of general orientation, problem definition and formulation, generation of alternatives (brainstorming), decision making and verification. Underpinning the technique are the beliefs that problems are part of life and can be dealt with by reflecting on various options and not responding with the first available response (Horton, 1994).

Self-instructional training involves teaching the child to talk his way through the problem. Firstly, to think "what to do," secondly, "what are the possibilities" and thirdly, "think about what to do." Then the child rewards himself by saying "I did well." The next statement deals with keeping the child on track if the first solution has not worked out. "I will have to try again." These self-statements are taught from an overt modelling situation to a covert inner talk in the child. Behavioural contingencies (for example self-reward or social reward, response cost, self-evaluation and rewarded homework assignments) are suggested to re-inforce self-instructional training (Horton, 1994).

Many programmes for example Nardi and Wales's (1991) and Isaksen and Treffinger's (1991) Creative Problem Solving have been developed to teach effective strategies for problem-solving, integrating both creative and critical thinking for young children through to adults (Isaksen & Treffinger, 1991).

Training in metacognitive awareness was started by Meichenbaum in 1977 (Tarver, 1986). Examples of programmes training metacognition include Instrumental Enrichment (Feuerstein, 1980), Cognitive Control Therapy (Santostefano, 1978) and CAP (coding, attention and planning training) initiated by Das and Conway (1992).

Feuerstein's (1980) Instrumental Enrichment programme is based on mediated learning. Deficient cognitive functions may be present during the input, elaborational or output phases of the mental act. Affective-motivational factors add a fourth category.

Flavell (1979) explains the concept of metacognition as the child being aware that he understands or not. Metacognition is a monitoring of which skills, strategies and resources are needed to perform a task effectively and the ability to use self-regulatory mechanisms to ensure the successful completion of the task, such as planning one's moves, evaluating the effectiveness of one's ongoing activities, checking the outcomes of one's efforts and remediating whatever difficulties arise (Baker, 1982).

Metacognitive training involves instruction in a variety of self-monitoring strategies (self-questioning, self-checking), a variety of self-instructional strategies ("What is it I have to do? I have to find the…") and a variety of executive strategies (scanning one's own repertoire of strategies and selecting the strategy most appropriate to the task at hand) (Tarver, 1986).

The history of the teaching of thinking skills can be traced to Meeker (1969) who designed the Structure of Intellect (SOI) programme (based on Guildford's Structure of Intellect). SOI defines 90 thinking abilities ranging from the basic foundational level to advanced higher-order thinking abilities. The programme is used currently in educational contexts in North America, U.K and in South Africa. It is useful in developing preschool skills. SOI teaches creativity and defines what skills are necessary at a certain stage and remediates where these are not yet established.

The second major impetus in the development of programmes to teach thinking skills was the Dimensions of Thinking curriculum which was designed collaboratively by educators who attended the Association for Supervision and Curriculum Development conference in 1984. Five dimensions of thinking were identified: metacognition, critical and creative

thinking, thinking processes, core thinking skills and content area knowledge (Costa, 1991a).

Programmes for the teaching of thinking skills proliferated after this conference. Of the many examples of thinking skills programmes described in Costa (1991b), a few are De Bono's (1992) Six Thinking Hats, the CoRT programme (De Bono, 1987, 1991), the California Writing Project (Olson, 1991) and Expand your Thinking (Hyerle, 1991).

Edwards (1991) demonstrated in a study that CoRT trained students achieved higher academic results than those in the control group.

In their research in effective thinking and intelligent behaviour Feuerstein, Rand, Hoffman, and Miller (1980), Glatthorn and Baron (1991), Sternberg (1985; 1991), Perkins (1991) and Ennis (1991) found that effective thinkers share common characteristics: persistence, decreasing impulsivity, listening to others with understanding and empathy, co-operative thinking (social intelligence) flexibility in thinking, metacognition, striving for accuracy and precision, sense of humour, questioning and problem posing, drawing on past knowledge and applying it to new situations, risk-taking, using all the senses, ingenuity, originality, insightfulness: creativity, wonderment, inquisitiveness, curiosity, and the enjoyment of problem-solving and a sense of efficacy as a thinker.

Wedell (1995) endorses the addressing of both cognitive and non-cognitive measures in interventions with children with delayed development. Non-cognitive measures include motivation, interest and affect. Children who have experienced failure may regard their efforts as futile. They feel frustrated and may give up. Intervention needs to take cognisance of children's attitudes to learning, self-esteem and task orientation (Dockrell & Messer, 1999).

Evans (1991) views the most valued outcome of education for young people amid social and technological change as being able to be adaptable in their learning and actions. Adaptability is dependent on propositional or declarative knowledge (facts), procedures and the ability to modify and control these executive procedures.

Programmes teaching emotional intelligence have received overwhelmingly positive responses from 1990 onwards. Improved Emotional Quotient (EQ) skills create higher achievement and improved social skills (Ornstein, 1986 and Lakoff, 1980, in Stone-McCown, Freedman, Jensen and Rideout, 1988).

The Confluent Model underscores the importance of teaching EQ skills as all aspects of brain development (thoughts, feelings and actions) are interconnected. The goal of the curriculum should shift from meeting institutional demands to meeting learner's needs. Emotional intelligence seeks to build empathy and optimism, control and delay gratification, management of feelings, effective socialisation, motivation and commitment to noble goals.

In this section educational interventions have been discussed. Curriculum models and teaching methods have been debated. How to stimulate learning and the subject of remedial education has received attention. Thinking skills and programmes to teach

thinking skills have been discussed. Medical interventions will be touched upon in the next section.

3.6.2 Medical interventions

Developmentally disabled persons are at increased risk for psychiatric and behavioural disorders that may respond to psychopharmacological intervention. When used judiciously drugs may have positive effects in facilitating changes in behaviour, cognition, mood and socialization (Harris, 1998b).

Many children, those for example who exhibit the condition of Attention Deficit-Hyperactivity Disorder (ADHD) are prescribed medication to optimise learning. The psychostimulant drugs, dextroamphetamine (Dexedrine), methylphenidate (Ritalin) and magnesium pemoline (Cylert) are considered drugs of choice in ADHD in children of normal intelligence. These medications have been shown to improve attention span, reduce impulsivity, reduce activity level, increase behaviour compliance, improve co-operation with peers and improve focus on learning tasks (Harris, 1998b).

Drug treatment of hyperactive, attention deficit behaviours has gained acceptance after decades of use and hundreds of controlled studies. In view of concern about growth and mood side effects, researchers have shown interest in other alternate medications. Some positive findings have been demonstrated using tricyclic anti-depressants but these do not emulate the effects of methylphenidate (Rapoport, 1983).

The reasons for speech and language therapy will be outlined in the next section. How language disorders affect development in other areas is also discussed.

3.6.3 Speech and language therapy

The DSM-IV (Diagnostic and Statistical Manual of Mental Disorders - Fourth edition, 1994) contains categories for the diagnosis of language disorders as a result of delayed development. These categories fall under the heading of specific developmental disorders (Franzen & Berg, 1998).

Speech and language intervention efforts are based on the hypothesis that language problems in the preschool years lead to reading problems in school (Whitehurst & Fischel, 2001).

Language disorders may affect receptive or expressive speech. Receptive deficits include the recognition of morphemes, the understanding of words, or the comprehension of meaning from syntactic or grammatical information. Expressive language difficulties comprise articulation, semantic paraphrasia (appropriate word usage), production of grammatically correct sequences and the grouping of words into meaningful units (Franzen & Berg, 1998).

Dockrell and Messer (1999) propose that oral language development should be a higher priority in the normal preschool programme than other aspects of the curriculum given the high percentage of preschool children reported to have language delays.

Further support for this idea comes from Costa and Lowery (1989) who add that the mental development of the child is highly correlated with the complexity of language used in the home.
Pisecco, Baker, Silva and Brooke (2001) advocate specific and comprehensive forms of intervention for children as their research pinpointed below average receptive language ability in children in those who developed reading disabilities. Snowling (2001) confirmed this in identifying a group of children with poor semantic and syntactic skills that are important for understanding written text, who later battled with reading.

Initial reading consists of decoding and has been found to be influenced by letter recognition, knowledge of letter sounds and print knowledge. Later when comprehension becomes important, semantic knowledge and conceptual ability become necessary. Stackhouse (2001) identified a group of children with different language difficulties who proved to be at risk for later literacy problems. She did a longitudinal study of 47 children with specific speech difficulties and their 47 matched normally developing controls on a range of speech, language, auditory discrimination, phonological awareness, letter knowledge, reading and spelling tasks. Results were compared at three points when the children were aged at about four, five and six years. Snowling (2001) added to this body of knowledge on the prediction of literacy problems in children by concluding that children with poor phonological processing experienced difficulties with later literacy.

Because children who have not mastered age-appropriate communication skills experience social difficulties, intervention to improve the understanding of pragmatics of language such as intonation and non-verbal cues should be included in their programme. These children may present as defiant, rejecting or lacking in tact (Dockrell & Messer, 1999).

Conti-Ramsden and Botting (2001) found that 40% of the children in the Nuffield Foundation Study experienced anti-social or emotional problems.

They attributed these behavioural difficulties to the child's frustration about not being able to communicate properly. Not only do language difficulties contribute to delayed language learning but research exists that children with speech and language difficulties experience difficulty with numerical reasoning and the learning of mathematics (Dockrell & Messer, 1999).

Early identification of hearing-impaired children and intervention to improve their knowledge of symbolic language has shown encouraging results in later achievement (Snow, Burns & Griffin, 1998).

This section has emphasised the role that language plays in cognitive development and that speech and language therapy can assist in the actualisation of a child's potential by improving communication. The next section deals with the role occupational and physiotherapy can play in improving areas of delayed motor development.

3.6.4 Occupational and physiotherapy

DSM-IV (1994) lists disorders of impaired motor co-ordination which can be treated by occupational and physiotherapists.

The occupational therapist is concerned with balance, movement and the synchronisation of sensory and motor skills. The physiotherapist focusses on the co-ordination of the different parts of the body, posture, muscle tone and respiration (Coetzee & Du Toit, 1986).

Intervention in the form of fine- and gross-motor exercise serves to improve the interconnections between neurons which can improve the condition of developmental dyspraxia. Dyspraxic children have poor co-ordination, perceptual problems, heightened sensitivity to sensory information, inability to express themselves in writing, limited concentration and an inability to follow instructions. Research evidence suggests that parts of the brain are not mature enough to allow the child to follow the path from action to response without the transmission being slowed down or interrupted (Portwood, 1999).

Bobath and Bobath (1975) designed neurodevelopmental therapy (NDT). It is the most widely used treatment approach for young children with motor disabilities. A less commonly used approach that is often used in combination with NDT includes the sensorimotor and proprioceptive neuromuscular facilitation approaches. These therapies aim to inhibit abnormal muscle tone and primitive reflexes and facilitate normal movement which transfers to improved daily functioning.

In a recent study on the effect of neurodevelopmental therapy on 17 cerebral palsy sufferers (of both sexes), the treatment group is reported to have demonstrated significant positive improvements in their spasticity (Kerem, Levanelioglu & Topcu, 2001).

There are four types of diagnostic testing which lead to different therapeutic approaches. Task-orientated tests establish the child's developmental level and therapy aims to improve proficiency on below average tasks. Ayres (1975) designed the second type of diagnostic testing and therapy which she called sensory integrative therapy. This therapy aims to improve the brain's ability to perceive, remember and plan the required motor activity. A third approach based on global diagnosis exists for example Doman-Delacato (United Cerebral Palsy Association of Texas, undated) where a diagnosis may be brain injury, and where the therapy is time-consuming and extensive. The fourth approach is process-orientated. Movement is viewed from the closed-loop model of perceptual-motor function. Component parts of movement are analysed and the focal underlying difficulty is remediated (Laszlo & Bairstow, 1985; Haywood, 1993).

Siebes, Wijnroks and Vermeer (2002) analysed all journal articles pertaining to motor development intervention for the previous decade to investigate what kind of treatment was being given. They reported that an array of trusted interventions such as neurodevelopmental, sensory integration, Vojta, Temple-Fay, Rood and Kabat were in use as well as a contemporary action system approach.

Horn, Warren and Jones (1995) describe a "hybrid approach" that combines the strengths of functional therapy with neuromotor intervention which they have termed neurobehavioural motor intervention. This approach includes identification of absent motor patterns, an assessment of where these are used functionally, and intervention techniques emanating from both traditions.

The task-orientated approach to remedying motor dysfunctions is through formalised exercise programmes. Therapeutic exercise is based on the principles of psychomotor development. Movement control originates from the head moving to the feet and from the centre of the body outwards. Large muscle control is striven for first followed by small muscle control. Haywood (1993) proposes the sequencing of motor tasks with a gradual increase in complexity from the child's current level of functioning as a start. Posture is corrected so that the body is aligned in such a way that minimal effort is required to sustain it. Movement development is based on exercises that focus on tension release, locomotion, balance, body and spatial perception, rhythm and temporal awareness, rebound and airborne activities, projectile management, management of daily motor activities, selected play skills, motor fitness, aggression management and swimming.

Frostig (1964) and Ayres (1965) believe that movement is secondary to perceptual input, but that muscular co-ordination serves to organise the perceptual input. The Frostig Programme for the Development of Visual Perception (Frostig & Horne, 1964) was designed to improve visual-perceptual ability in visual-motor co-ordination, figure-ground, form constancy, position-in-space and spatial relationships. Physical movement and written exercises facilitate visual perceptual development. Ayres (1975) elaborates by putting forward her belief that neurophysiological integration is influenced by visual, auditory, tactile, motor and sensorimotor training. Motor delays can be remediated through sensory integration.

These treatment methods are used today as Baskin (2002) describes in an anecdotal article on children who experience fine-motor difficulties. She offers a rationale for treatment and lists methods of intervention used by occupational therapists.

Sensory integration therapy includes tactile and vestibular stimulation, and the normalisation of the postural reactions through this stimulation (Haywood, 1993).

The contemporary belief that when intellectual activities are accompanied by movement, academic enrichment occurs. Early theorists for example, Cratty (1974), embraces this concept by adding that children who cannot control their movements adequately develop a poor self-concept and encounter social and emotional difficulties.

Children with delayed milestones often deal with aggressive feelings inappropriately (Harris, 1998b). Under correct supervision activities that involve kicking, hitting, tug-of-war, king of the mat and beam, and wrestling are effective ways of dealing with aggression (Arnheim & Sinclair, 1975).

Not only do occupational and physiotherapy interventions contribute to lessening motor, sensory, balance and tone difficulties in children, they contribute to the psychological welfare of the child in the development of a more positive self-concept (Harris, 1998b).

The next section explores the area of psychological interventions.

3.6.5 Psychological interventions

Children with delayed development experience a wide range of emotions such as feelings of failure, inferiority, rejection, anger, depression and envy, and individual, group or

family therapy or counseling can provide a forum for dealing with these feelings. Psychotherapeutic interventions focus on adaptive functioning by alleviating the behavioural symptoms and enhancing personal competence (Harris, 1998b).

Psychological interventions include counselling, psychotherapy, cognitive-behavioural methods and behaviour modification in an effort to improve the learning capacity of a child. Most programmes have a cognitive-behavioural basis which requires the involvement of the child in learning to regulate his behaviour by means of thought processes.

Isenberg and Brown (1997) in their concern for children from disadvantaged backgrounds suggest the teaching of coping skills to children to improve self-confidence and self-efficacy. One can learn to cope with problems that are viewed as resolvable. They suggest a combination of correct nutrition, predictable, consistent relationships with caring and available adults, strong emotional ties within the family, regular acceptance and affirmation of actions, and stimulation within the school and home.

The role of motivation is paramount in any kind of psychological intervention. Deci and Ryan (1985) suggest the encouragement of intrinsic motivation where the child relies on the predictability of a responsive environment. Personal choice and positive competence feedback promote intrinsic motivation. Intrinsically motivated children show an innate desire to master the environment in a self-detemining way and enjoy learning. Extrinsic motivation fosters dependent children who rely on external direction and rewards.

3.6.5.1 Psychotherapy

Psychotherapeutic interventions may involve the parent, caregivers or the child. Harris (1998b) suggests Attachment theory as a basic model for psychotherapy for developmentally delayed children. Common factors in therapy, such as a relationship, an explanation of current difficulties and a method for understanding them, hold for attachment theory. Bonding between parent and child is investigated as this provides a basis for a child in the formation of other relationships. The emergence of attachment leads to a secure base from which the child can develop personally from dependence to autonomy. Attachment theory can be used to address the following aspects of psychotherapy: the provision of a secure base in the therapeutic relationship, the establishment of personal competence, the importance of affect and its processing, the role of cognition, separation and loss and sexuality (Holmes, 1993).

3.6.5.2 Behaviour modification

Behavioural modification is used with children with a variety of developmental difficulties, for example disruptive behaviour patterns in children with attentional difficulties. This therapy seeks to change maladaptive behavioural patterns that are the result of faulty learning through new learning. Treatments aim to enhance adaptive, socially desirable behaviour.

Behaviour modification was introduced in 1953 by Skinner (1974). Changing behaviour requires defining the target behaviour, assessment of the level of target behaviour and procedures to increase or decrease these behaviours. Techniques for decreasing behaviour

include re-inforcement-based methods (differential re-inforcement of other behaviour, differential re-inforcement of incompatible behaviours, time-out and response cost), punishment (reprimands and restitution) and extinction (Horton, 1994).

Many examples of the successful use of behaviour modification exist. One of these investigated the behaviour modification strategy of co-ercion in 84 two parent homes in Sweden. Parents reported that their preschool children were repeating transgressions. In the light of a ban on corporal punishment since 1979 in Sweden the strategy of co-ercion was used. Palmerus and Jutengren's (2004) results on the effectiveness of this strategy were positive.

3.7 Chapter conclusion

This chapter has reviewed the legislation in the US, UK and South Africa governing educational policy regarding children with delayed development. The rationale for and approaches to intervention were highlighted. The history of interventions was traced detailing numerous effective interventions both in South Africa and abroad. The aims of intervention were stated. A comprehensive outline of multidisciplinary interventions to assist in improving delayed development in children was given. The knowledge in this chapter contributed to the development of the programme of intervention.

An optimal treatment plan for a child with developmental delays requires an understanding of the nature and extent of the difficulty, a comprehensive assessment and the co-ordinated efforts of a multidisciplinary team.

Chapter four outlines the empirical investigation of the programme of intervention on children with delayed development.

CHAPTER FOUR

THE EMPIRICAL INVESTIGATION

The first chapter introduced the issue of at risk children entering school at a disadvantage due to developmental delays and the question was posed whether their delays could be amenable to a stimulation programme. The second chapter outlined the theories of development, normal developmental milestones and developmental delay, reasons for developmental delay and the concept of school readiness. Multidisciplinary interventions to assist children with barriers to learning were discussed in chapter three. The intervention programme described in section 4.3.5 was developed using this background of knowledge.

The implementation of the intervention programme on preschool children with developmental delays is discussed in this chapter. The motivation for the study, goals of the research and the method will be outlined. Regarding the method, the research design, the selection of the participants, measuring instruments, the programme of intervention and the procedure followed will be described. The hypotheses of the study and how the data will be statistically analysed will conclude this chapter.

4.1 RESEARCH PROBLEM AND MOTIVATION FOR THE STUDY

The research problem centers around the issue of the many children who enter formal education who have not developed the skills, habits and attitudes expected of children in the first grade. Many of these children do not receive any intervention to enable them to improve their levels of school readiness and consequently they are unable to achieve their potential.

The general research question asks whether there is any value in programmes of intervention for preschool children at risk for formal education. The specific research question asks whether there will be differences in the abilities of preschoolers with language and/or fine-motor delays after a programme of intervention.

The rationale for the research question, as also explicated in chapter 1, is based on the current literature that a large group of preschool children with delayed development enter formal schooling at a disadvantage when there are interventions which can improve the skills of these children to lessen their at risk status (Guralnick, 1998). Donald, Lazarus and Lolwana (2002) have confirmed that there is a large percentage of children at risk for education. Although the etiologies for disadvantaged status have been described by numerous researchers for example, Franzen and Berg (1998) and Luiz (1999), and many multidisciplinary interventions are available (Sands, Kozleski & French, 2000), only a few attempts have been made to examine the efficacy of intervention programmes in improving the abilities in preschoolers with delayed development. No study has been embarked upon to evaluate the efficacy of a short-term stimulation programme on children with delays in fine-motor and/or language development. Many preschool programmes

exist, but none has been empirically tested in this group of children. The present study hopes to show that preschool children with delayed development improve their abilities after a programme of intervention.
The goals of the research are based on these research problems and are detailed below.

4.2 GOALS OF THE RESEARCH

The general aims of this project are directed to contribute to developmental psychology, preschool education and intervention research. The research study was undertaken to add to the body of knowledge on the educational development of young children, the concept of school readiness and the value of intervention in improving the abilities of children with delayed development.

The present study aims to provide empirical research data on the effect of an intervention programme on preschool children with delayed development.

The study has four specific aims. The first is to test whether an intervention programme is able to improve the abilities in a group of preschool children with delayed language and/or fine-motor difficulties. The second and third specific aims are to examine the effect of the intervention on male and female children with delayed development separately. The fourth aim is to evaluate the programme of intervention from both Payne's (1994) and the Joint Committee on Standards for Educational Evaluation (Sanders, 1994) programme evaluation models.

Secondary aims of this project revolve around this project's role as an educational campaign of stimulating interest in parents regarding their children's school readiness and supporting the teachers. Judging from attendance at talks, telephone calls from parents and interest in the school readiness reports, definite interest was aroused by the study. Ownership and involvement were encouraged as community and parental participation are of the most important aspects of our current policy of inclusive education (Louw, Donald & Dawes, 2000).

The specific operationalised aim of the proposed study is to ascertain if there are statistically significant differences between pre- and post-intervention test scores on the six subscales of the Griffiths Scales of Mental Development (Luiz et al., 2000b) and the Draw-a-Person test (Harris, 1963) for a group (N=21) of preschool children (of five to six years of age) of mixed gender. These children are fine-motor and/or language delayed as measured by selected subtests of the Group Test for the Evaluation of School Readiness (Sonnekus & Le Roux, 1995a). The scores of the children who had participated in a stimulation programme are to be compared with a control group (N=22) of equally language and/or fine-motor delayed children utilizing a Pretest-Posttest Control Group design.

4.3 METHOD

The methodology of the study can be divided into three phases. After the screen-testing in phase 1, the Pretest-Posttest Control Group design was employed in the second phase. The first and second phases are described in this chapter. Phase 3 involves an evaluation of the programme which will be discussed in the final chapter.

The method which includes the research design, participants, selection instrument, measuring instruments, programme of intervention and procedure, is detailed in this section.

4.3.1 Research design

This section introduces the professional and ethical standards which govern how this study is to be conducted. A discussion on quantitative research ensues. The Pretest-Posttest Control Group design is outlined. This section concludes with a discussion on external and internal validity.

4.3.1.1 Ethical standards

Before any empirical investigation is initiated, the researcher must consider the ethical treatment of the research participants. The American Psychological Association (1992), the professional body of psychologists in the United States of America, has developed a set of fundamental principles which have been adopted by the Psychological Society of South Africa (2000). The following professional and ethical standards were adhered to in this study:

The researcher is responsible to plan and conduct the research project, with respect for the law and safeguarding all participants' rights. Institutional approval must be obtained. In a study involving children, consent must be obtained from the parents prior to the research commencing and parents of the participants may choose to discontinue their participation. Restrictions govern studies involving deception. All information and the results of the study are to be made available (American Psychological Association, 1992; Professional Board for Psychology, Health Professions Council of South Africa, 2000; Psychological Society of South Africa, 2000).

4.3.1.2 Quantitative research

A paradigm is a way of looking at the world and it guides how research is conducted. The dominant paradigm that has guided educational and psychological research has been positivism and post-positivism. This paradigm states that the social world can be studied and measured in the same way as the natural world in a value-free way yielding cause-effect explanations. Quantitative research designs are used mainly within this perspective. Quantitative researchers use a deductive form of reasoning and work from universal propositions. Positivist researchers seek the one true reality and post-positivists acknowledge an imperfect reality due to human limitations (De Vos, 1998a; Mertens, 1998).

Whatever one's paradigm, one needs to be aware of how one views the world and how this affects one's research (Mertens, 1998). The present study is underpinned by a post-positivist paradigm in which cause-effect relationships are sought between an intervention and the effects of this intervention on the abilities of preschoolers with delayed development, with the understanding that reality is influenced by human limitations.

Quantitative approaches strive for external validity which refers to the extent to which findings from research can be generalised. Quantitative research methods however are limited in portraying and generalising the varied realities of a teaching environment (Vulliamy, 1990). The present study accepts this as a limitation. An attempt was made to address this in the selection of the participants and homogeneous school environments, by uniformity in the selection, use of standardized measuring instruments and in the implementation of the intervention programme.

The quantitative Pretest-Posttest Control Group research design is discussed in the next section.

4.3.1.3 The Pretest-Posttest Control Group design

The Pretest-Posttest Control Group design is a quasi-experimental design. This design is the widest used between-group design in treatment-outcome research (Kazdin, 1980). The Pretest-Posttest Control Group design was chosen to evaluate the effect of the intervention programme on children with delayed development.

In educational research it is difficult to assign subjects in such a manner as to meet the demands of a true experimental setting. This design is the equivalent of a true experimental design without random assignment of participants to the groups. The disadvantage of not randomly assigning participants to groups is that the experimental and control groups may not be equal. Kerlinger (1986) regards this as the major weakness of this design. To circumvent this weakness, both he and Fouché and De Vos (1998) advise that samples are selected from as similar populations with regard to for example, sex, age and social class as possible. Group homogeneity was strived for as much as possible.

The Pretest-Posttest Control Group design consists of two groups. One group receives the intervention and the other does not. The groups are tested before and after the intervention. The effect of the intervention is reflected in the scores from pre- to post-assessment (De Vos, 1998b; Kazdin, 1980).

The Pretest-Posttest Control Group design can be diagrammed as follows:

Group 1 O1 X O2
Group 2 O3 O4 X

The symbols used in the diagram are those of Campbell and Stanley (1963) as explained in Kazdin (1980). O stands for observation or assessment of behaviour, X for the experimental manipulation or treatment. O1 to O4 represent, in temporal order, the assessments: pre-tests or post-tests, depending on whether the intervention precedes or proceeds the assessment.

Intervention research aims at determining how much change takes place and how many participants make a difference of a particular magnitude. The pre-test gives an indication of the status of the groups before intervention. The use of a pre-test affords a statistical advantage in providing a baseline for the data analysis. The post-test will indicate whether change took place as a result of the intervention, not only with regard to groups but also

with regard to individuals. According to De Vos (1998b) the degree of change is important in research.

For the purposes of this study, possible improvement in abilities was measured by comparing the differences between pre- and post-test scores on the subscales of the Revised Griffiths Scales of Mental Development and on the Draw-a-Person test. The tests will be discussed later in this chapter.

For ethical reasons the intervention was offered after post-testing to the children who did not receive the treatment during the experiment.

External validity is discussed in the next section.

4.3.1.4 External validity in research

External validity refers to the extent to which results of a study can be generalised. Threats to external validity relevant to this study include pre-test sensitisation, post-test sensitisation, multiple treatment interference, generality across constructs and outcome measures, combination of selection and treatment, combination of experimental setting and treatment, combination of history and treatment, time of measurement, and treatment effects (Kazdin, 1980).

As pre-testing is built into the design of this study, pre-test sensitisation may be viewed as a potential threat to the external validity as the participants' results may have been influenced. In this study both the treatment and control groups were pre-tested, thus avoiding contaminating effects of pre-test sensitisation. Post-test sensitisation and multiple treatment interference may affect generalization of this study as obtained results may not have been achieved solely due to the intervention, but to other confounding factors (Kazdin, 1980). Post-test sensitization is controlled for in this study as both groups were post-tested. Multiple treatment interference remains a threat to the generalization of results. The programme of intervention was followed according to the instructions to limit this effect.

Generality of constructs and outcome measures influence external validity of a study. Although standardised testing was used and a structured programme of intervention was followed in this study, contributing to the generality of constructs and uniformity of outcome measures, these remain threats to external validity (Kazdin, 1980). As mentioned above, Vulliamy (1990) warns that the results yielded by quantitative methods do not always reflect the full extent of the teaching situation.

Beck, Andrasik and Arena (1984) regard a limitation of this design as not controlling for the effects of participating in experimentation, which is applicable in this study. Beck et al. (1984) and Kazdin (1980) cite positive client expectancies as influencing results. These threats, however, should not affect the outcome of the study as preschool children do not have insight into research.

Further threats to external validity in this study are the combination of selection and treatment, the combination of the experimental setting and treatment, the combination of history and treatment, and time of measurement. All caution was taken in limiting these

effects. Although the study was both commenced and completed in the first term, this is regarded as sufficient time so as not to pose a threat to external validity.

According to Rubin and Babbie (2001) a researcher cannot generalize findings if both sexes are not adequately represented in the research sample. In this study not only are both genders represented in the sample, but the effect of the intervention on the male and female gender will be investigated separately.

Internal validity will be discussed in the next section.

4.3.1.5 Internal validity in research

Internal validity results when the dependent variable's results (difference scores between the pre- and post-tests) are attributable to the independent measure (intervention). Internal validity eliminates other explanations for the results (Kazdin, 1980).

Threats to internal validity include history, maturation, pre-testing, instrumentation, statistical regression, selection bias, attrition, demand characteristics, and therapist bias (Kazdin, 1980; Kerlinger, 1986). History refers to any event occurring in the experiment or in the life of participants that may account for the results in certain individuals, that may restrict the internal validity of the study. Maturation refers to changes over time or processes within the individuals which may have influenced results in this study. Testing threatens internal validity by making participants familiar with the test material. In this study both standardised tests were used during pre- and post-testing and to what extent the children became familiar with the material is difficult to determine. The tests were administered six to seven weeks apart. Familiarity effects were minimised as the period between pre- and post-testing was sufficiently long. At the same time the period was sufficiently short to minimise maturation effects. According to Beck et al. (1984) the use of a control group rules out threats to internal validity such as history, maturation and testing.

Instrumentation involves changes in the dependent measure in that ratings change or the participants' responses are influenced by the tester. The effect of this threat is restricted by the fact that standardized tests were used in this study. Statistical regression refers to scores reverting to the mean when tests are re-administered. In this study standardized tests were used by trained psychologists to control for this effect (Kazdin, 1980).

Selection bias is dependent on differences in groups after groups are selected. This may be relevant to this study as groups may not be homogeneous as no random allocation was performed. Michaud (1995) adds that most studies lack control groups and groups which have not been matched. In this study, a control group is part of the design and all participants were selected ex post facto on the grounds of delayed development. Kerlinger (1986) advises that groups are selected from a similar population to maximize homogeneity of groups so as to ensure internal validity.

Attrition or experimental mortality refers to the loss of subjects. As long as the sample remains adequate, the overall statistics will not be weakened (Kazdin, 1980).

Demand characteristics may threaten the internal validity of a study in that the behaviour of the participants may be influenced by the information provided by the researcher. Kazdin (1980) advises that participants should not know which treatment condition they are in to counteract this effect. In this study preschool children who do not have insight into different treatment conditions participated.

Beck et al. (1984) view therapist bias as a potential influence on results when the psychologist assessing the children is the same person as the researcher. Vested interests in trying to prove a certain hypothesis may sway results in a particular direction. Kazdin (1980) refers to this as experimenter bias. This effect is controlled for as standardised tests are being used for pre- and post-testing and another psychologist trained in the Griffiths Scales was employed to assist with testing to contribute to objectivity.

Beck et al. (1984) propose treatment administration as a possible confounding factor in research. Their concerns revolve around the duration of treatment and adherence of therapists to the intervention programme. The potential influence of therapist bias is counterbalanced by the fact that the researcher is administering the intervention programme alone which will counteract differences in interpretation and presentation. The use of a Pretest-Posttest Control Group design in which only two groups are used maximises internal validity.

This section has outlined the research design against the backdrop of ethical standards, quantitative research, the Pretest-Posttest Control Group design, and external and internal validity. The selection of the participants for the study is dealt with in the next section.

4.3.2 Participants

Purposive sampling in which a specific sample is sought was used to obtain the sample of children who are at risk for learning. Random allocation could therefore not be used. Two hundred and twenty-five children were screen-tested at four different preschools to yield a the sample of 43 children from two of four schools. The four schools were selected on the grounds that there were at least 50 children at each preschool. Smaller schools were not selected as the researcher wished to work with the weakest children at two of the schools to control for homogeneity in terms of delayed development. The screen-testing is described in the next section.

The sample was composed of the 43 children achieving scores below the 50th percentile at two of the four schools. The two schools were homogeneous in many respects. Socio-economic levels are regarded as similar at the two schools. The nursery schools are run independently of the primary schools at which many of the children continue their formal schooling. The teachers at the two schools were qualified. The teacher to child ratio was the same at the two schools (one teacher to 25 children). Schools are referred to as groups 1 and 2 to maintain confidentiality and anonymity of the participants. The other two schools were regarded as less suitable for participation in the project.

Children in Group 1 formed the experimental group who received the stimulation programme and children in Group 2 formed the control group who only received the stimulation programme after completion of the experiment. The allocation of the groups to experimental versus control groups was done randomly (see section 4.3.6). Group 1

consisted of 21 children and Group 2 of 22. There were 21 children in Group 1 as one child was moved to another school in the third week of the term.

Certain children were not selected due to suspected intellectual handicap where all scores obtained were very low in comparison with the rest of the group. No children were suspected of cerebral palsy or autism. Letters of consent (Appendix A) were sent to parents requesting permission for the selected children to be included in the study. When permission was not granted by parents, the child scoring the next lowest score on the list of results was selected and consent requested.

Parents who gave consent for their children to participate in the study were requested to complete a biographical questionnaire. Information was checked for example birth dates, home language, medical and educational history to assist in the identification of possible exclusion criteria. No children were excluded based on the biographical information.

The significance of characteristics of the sample lies in the influence of the characteristic on the study. Gender frequencies, English first or second language speakers, cultural affiliation and the number of children who have attended school before were noted as these characteristics may operate as confounding variables that influence statistical results.

The children's ages ranged from five to six years. The average age of the participants in Group 1 at pre-testing which took place in January 2002 was 5 years 4 months. The average age of these children at post-testing (March 2002) was 5 years 6 months. The average age of the preschoolers in Group 2 at pre-testing was 5 years 7 months and at post-testing was 5 years 9 months.

Gender frequencies were marginally disparate in the two schools. The female to male frequencies were: Group 1: 6:15, and Group 2: 8:14. Overall, the gender ratio was 32,6 % female to 67,4 % male.

There were English second language learners at both schools. There were four English second language learners in both groups. In Group 1 there were two children who spoke Tswana and two children who spoke Xhosa. In Group 2 there were two children who spoke Xhosa, one who spoke Venda and one child who spoke Afrikaans. In terms of cultural affiliation in Group 1 there were five Indian children and in Group 2, there were four Indian children.

The majority (85%) of the children at both schools had attended nursery school before.

The most significant uncontrollable variable was regarded as the separate schools. Unmeasureable variables that could affect the dependent variable, the intervention programme, included the different preschool programmes being utilised at the different schools, facilities at the schools, teacher competencies and teacher personality characteristics. Variables known to contribute to school readiness include socio-economic levels, stimulation and stability at home, and parental personality characteristics, although not all of these were considered in this study (Grové, 1984; Paro, Olsen & Pianta, 2002).

The selection of the participants was discussed in this section. The next section outlines the choice of the selection instruments.

4.3.3 Selection instrument

In this section the rationale for the choice of the screening test namely certain subtests of the Group Test for the Evaluation of School Readiness (Sonnekus & Le Roux, 1995b) is discussed. The standardization, scoring and administration, and the results of the screening test are outlined.

4.3.3.1 Rationale for the choice of the Group Test for the Evaluation of School Readiness

In the first phase of the research all children at the four preschools were screen-tested using two subtests of the Sonnekus and Le Roux's (1995b) Group Test for the Evaluation of School Readiness for five and a half year old Preschoolers (Group Test for the Evaluation of School Readiness). This test was selected as it was designed to obtain a reliable estimation of a preschooler's strengths and weaknesses. It has been standardised in South Africa and it has adequate reliability.

Relevant subtests were selected from the Group Test for the Evaluation of School Readiness as children with delayed development in language and fine-motor skills were to be identified. Tests Five (Language Acquisition) and Seven (Fine-Motor) were chosen.

4.3.3.2 Standardisation of the Group Test for the Evaluation of School Readiness

The Group Test for the Evaluation of School Readiness was standardised over three years. The Pearson Product Moment correlation of 0,57 was obtained showing that the test correlates with school performance. Reliability of the test stands at 0,83 according to the Kuder-Richardson formula (Sonnekus & Le Roux, 1995a). Although certain subtests were selected and this may jeopardise the reliability of the test, this was regarded as less relevant as these tests were only used for screening the children with fine-motor and/or language delays.

No information on the effect of gender or validity of the test is mentioned in the manual for the Group Test for the Evaluation of School Readiness. The test has apparent face validity.

4.3.3.3 Scoring and administration

Administration and scoring was followed according to the manual for test five (Language Acquisition) and test seven (Fine-Motor). The children were tested in groups on tests five and seven. Administration of the third section of test five, namely Language and Memorisation, was applied individually instead of in groups of five children, as stated in the manual, to enhance reliability. The laid-down scoring procedures were followed and the test was called Story Memory. The total score for sections one and two of test five called Language, is seven. The total score for Story Memory is five. The total score for test seven (Fine-Motor) is seven. The total score for all the tests composing the screen-test battery is 19.

All the 225 children at four schools were tested in groups of 25 except for the Story Memory which was administered individually. The results of the children (N=86) who achieved the 21 or 22 scores of below the 50th percentile at each the four schools are shown in Table 4.1. Two schools regarded as the most homogeneous were selected for the study.

4.3.3.4 Results of the screen-testing

Table 4.1 shows the results of the screen-testing. The hypothesis stated for each of the proficiency tests was:

Null hypothesis: Mean 1 = Mean 2 = Mean 3 = Mean 4, where 1, 2, 3 and 4 represent the four different schools. The alternative hypothesis states that at least two means are different.

Table 4.1 Average test scores for screening tests per school

	Group 1 *	**Group 2 #**	**Group 3**	**Group 4**	**F**	**Df**	**P**
N= 86	21	22	21	22			
	Mean S D	Mean S D	Mean S D	Mean S D			
Language (1-7)	4.24 1.61	4.55 1.37	4.71 1.10	5.09 1.66	1.28	58	0.28
Fine-Motor (0-7)	3.43 1.29	3.55 1.22	3.86 1.35	2.73 1.86	2.33	58	0.08
Story Memory (0-5)	2.14 1.62	3.23 1.38	1.81 1.54	3.36 1.50	5.67	58	0.001
Aggregate score	11.52 2.40	13.32 2.53	11.43 2.01	13.41 2.87			

Key:

*	Intervention group
#	Control group
S D	standard deviation
F	Frequency
Df	degrees of freedom
P	p value

Table 4.1 shows group differences on the one-way Analysis of Variance (ANOVA) tests that were performed on the screening tests. No group differences are shown at the 5 % level of significance on Language ($F = 1.28$, $df = 58$, $p = 0.28$) and Fine-Motor Skill ($F = 2.33$, $df = 58$, $p = 0.08$). Fine-Motor did show a difference between the groups at the 10 % level of significance with Group 4 scoring the lowest average of 2,73. There is a significant group difference at the 1 % level of significance on Story Memory ($F = 5.67$, $df = 58$, $p = 0.001$). The children in Group 3 have a lower Story Memory level with a mean of 1.81 than the other groups using the Bonferroni test for post hoc comparisons ($p < 0.05$). None of the other groups had significantly different means when compared to one another.

The null hypothesis is accepted for all tests except for Story Memory where the hypothesis was rejected. The alternative hypothesis is accepted that at least two means are different indicating that with regard to Story Memory the groups were not of the same proficiency level at the outset.

Groups 1 and 2 were selected for the intervention and control groups respectively as they were found to be the most homogeneous with regard to the screening tests.

The measuring instruments used in this study to measure the effect of the intervention programme on the children's abilities are discussed in the next section.

4.3.4 Measuring instruments

The Revised Griffiths Extended Scales of Mental Development (Revised Griffiths Scales) and the Draw-a-Person test were used as measuring instruments in this study. These tests are discussed in this section.

4.3.4.1 The Revised Griffiths Extended Scales of Mental Development

The Griffiths Extended Scales of Mental Development (Griffiths, 1970b) have been revised and are currently under standardisation for South African children, a project undertaken by the University of Port Elizabeth (Prof. D. Luiz, personal communication, 2 April, 2001). The Revised Griffiths Extended Scales of Development (Griffiths Scales) were used as a measuring instrument during the pre- and post-testing in the Pretest-Posttest Control Group design used in this study (Luiz et al., 2000b).

Reasons for the choice of the Revised Griffiths Scales, the psychometric properties, administration and scoring and the research background to the Revised Griffiths Scales are provided in the next sections.

4.3.4.1.1 Motivation for the selection of the Revised Griffiths Scales

The predictable and sequential nature of child development leads one to the natural choice of an instrument that samples from behaviours characteristic of levels of development (Lidz, 1991). As an example of a curriculum-based measure, this form of criterion-referenced measurement is recommended for preschool assessment (Pretti-Frontczak, Kowalski & Brown, 2002).

The Griffiths Scales are a comprehensive test of development which may be used to assess school-readiness. Based on maturation and the universal phenomenon of play, the test is regarded as culture-fair (Luiz, Barnard, Collier, Kotras & Stewart, 2000a).

In terms of ethics, testing was not stressful for the children as the Griffiths Scales are regarded as a test by professionals and play by children (Houston-McMillan, 1986).

Worsfold's (1993) study provides further support for the choice of the Griffiths Scales as a measuring instrument in this study. She obtained a significant correlation between the Griffiths Scales scores of preschoolers and their respective end of Grade 1 scholastic

results. This correlation confirms that results from a Griffiths Scales assessment can be regarded as a test of school readiness. She added that the below average group was identified as an at risk group with a high level of predictability which confirms the usefulness of the Griffiths Scales to predict potential problems in children with accuracy.

The next section describes the content and standardisation of the Griffiths Scales.

4.3.4.1.2 Psychometric properties of the Revised Griffiths Scales

The Revised Griffiths Scales consist of the following six subscales which constitute the General Quotient (GQ) and are equal in difficulty at each age level:

The Locomotor Scale (A) evaluates gross-motor co-ordination. Examples of items include walking, running, skipping and hopping.

The Personal-Social Scale (B) assesses personal and social development by assessing the child's ability to wash and dress himself and socialise with friends.

The Hearing and Speech Scale (C) assesses the child's ability to understand and use language. Auditory memory for sentences of increasing length is tested as well as the child's understanding of similarities and differences.

The Eye and Hand Co-ordination Scale (D) checks visual-motor co-ordination. Items on this subscale include design copying, cutting out, paper-folding and letter and number copying.

The Performance Scale (E) examines non-verbal reasoning, skill in manipulation and speed of work. The assessment involves the child's ability to do puzzles such as a form board and copy patterns using coloured blocks within age appropriate time limits.

The Practical Reasoning Scale (F) evaluates the numerical development and solution of practical problems of children. Items include counting, questions relating to size, height and weight and the arrangement of pictures into a correct sequence (Luiz et al., 2000a).

Although the Revised Griffiths Scales are not as yet standardised for a South African population, they were standardised on 2,260 children in the United Kingdom. Each and every item used in the Revised Scales has been selected and individually and separately standardised on samples of children. Although each subscale measures a different aspect of development, the scales are equal in difficulty and statistically similar (Griffiths, 1970a). This enables comparison across scales, individuals and time (Luiz, 1999). The total quotient for the six scales is 100,18 with the standard deviation at 12,76. Averages and standard deviations of the subscales are similar enabling comparison of the child's performance across the different subscales. Test-retest reliability of 0,77 was obtained. Construct validity was determined by comparing the Griffiths Scales with the Merill - Terman Scale. Correlations between the two scales ranged from r = 0,79 to r = 0, 81 for the different age groups (Griffiths, 1970a). Predictive validity ranged from correlations of r = 0,85 to r = 0,90 in a study by Ludlow and Allen (1979) where Revised Stanford- Binet scores of children with Down's Syndrome were compared with their Griffiths Scales' scores.

Luiz, Foxcroft, Worsfold, Kotras and Kotras (2001) confirmed the predictive validity of the Griffiths Scales as the children's scores correlated significantly with their later scholastic performance. They concluded that later scholastic performance could be predicted from Griffiths Scales scores.

Standardisation will not affect the results of this project as pre-test and post-test scores will be compared in respect of whether the children received the intervention or not.

The administration and scoring of the Griffiths Scales are detailed in the next section.

4.3.4.1.3 Administration and scoring of the Revised Griffiths Scales

Administration and scoring of the Revised Griffiths Scales were followed according to the manual. Each child was evaluated individually. The Revised Griffiths Scales takes about an hour to administer. A record sheet is used to record all items passed or failed. Items are graded developmentally across all subscales. After six consecutive items failed in a subscale, testing is terminated on that subscale as the child's level on that particular subscale has been reached. All items passed were used to determine an equivalent age level in months (Luiz et al., 2000a).

All children were assessed across all the subscales. The Global Quotient was not required in this study.

Detailed reports were written and sent to parents of all the children tested on the Revised Griffiths Scales. In the light of the above proven predictive validity, these reports can be regarded as an indication of the children's school readiness.

4.3.4.1.4 Research background to the Revised Griffiths Scales

This test has been researched in many counties including the United Kingdom, Canada, Norway, France, Columbia and South Africa (Luiz et al., 2000a)). Heimes (1983) found significant high positive correlations between the JSAIS and the Griffiths Scales and established the validity of the test for an English- and Afrikaans-speaking South African population.

Mothuloe (1990) demonstrated that the performance level of South African black children was found to be similar to the original British standardisation sample. A significant positive relationship between the Griffiths Scales GQ and the Aptitude Test for School Beginners (ASB) with the end of grade 1 year results was obtained. He concluded that the British norms are applicable for school-age Setswana-speaking children.

Bhamjee's (Luiz & Bhamjee, 1991) study indicated the Griffiths Scales as useful but not entirely valid for South African Indian children owing to a sex-based difference on the Personal-Social subscale. The performance of girls was significantly higher than for boys. A possible reason for this was given as cultural rather than constitutional or biological.

Allan (1992) demonstrated that there were no significant differences between the black, coloured, Indian and white groups on the Personal-Social and Practical Reasoning

subscales. The coloured and black samples did not differ with respect to the four other subscales. The British children obtained higher scores than the black and coloured children's scores with the exception of the scores on the Locomotor subscale. All South African children obtained higher scores than their British counterparts on the Locomotor subscale. South African white children performed better than the British on the Hearing and Speech and Practical Reasoning subscales, and the overall General Quotient. She reported item bias regarding certain items and suggested that these be revised in the current South African revision and standardisation.

Luiz, Oelofsen, Stewart and Mitchell (1995) concurred with her. Many of the problematic items are regarded as culturally biased and out of date. These factors and the broader social context in which children live in South Africa were taken into consideration in the revision. A multidisciplinary panel was involved in adapting these items to render them more acceptable to all South African language and cultural groups. After three phases of pilot testing, the new and modified items were finalised and included in the new Revised Griffiths Scales.

According to Kotras (N. Kotras, personal communication, February 17, 2004), gender did not effect any significant differences in the results of the Revised Griffiths Scales research which have not yet been published.

The Draw-a-Person test is the other measuring instrument used in this study. A discussion of this test follows.

4.3.4.2 Draw-a-Person test (Harris, 1963)

The Draw-a-Person test is regarded as one of the oldest and most used of psychological tests. Goodenough devised the first scale of mental age from the evaluation of the human figure drawing in 1926. This was revised by Harris in 1963 and the test became known as the Goodenough-Harris Drawing Test (Di Leo, 1973).

The Harris revision includes a more extensive scoring system including a conversion to an IQ score, the introduction of a female drawing as an alternative, and drawing of the self as a third alternative vehicle for exploring the self-concept (Sattler, 1982).

Two main approaches to the interpretation of the Draw-a-Person test exist. The first approach views the Draw-a-Person test as a projective test. Machover's (1949) Draw-a-Person test can be used to assess personality. This is based on the assumptions that the drawing represents the expression of self and the body. Distortions of the figure can be interpreted as symbolic of inadequacies of the self-image. Di Leo (1973) views a child's drawing as an indication of emotional adjustment. Using the Goodenough-Harris test Koppitz (1968) designed a mental test as well based on the human figure drawing which can be converted to an IQ score. She identified 30 emotional indicators to evaluate emotional adjustment (Koppitz, 1968). Cox (1993) however cautions against claims made about drawings as a primary indicator of emotional maladjustment. She suggests that these claims be made in combination with knowledge about other aspects of the child's functioning.

The second interpretation of the test sees it as a developmental test of intellectual and conceptual maturity. Di Leo (1973) states that differences in drawings of the human figure have been related to chronological age and intellectual maturity, forming the basis for the assessment of intelligence. Conceptual maturity according to Harris (1963) concerns the ability to perceive and discriminate similarities and differences, the ability to abstract these and the ability to generalise or classify objects correctly. The child's drawing is an index of that concept. The Draw-a-Person was used to gain an index of intellectual maturity in this study.

The motivation for the selection of the Draw-a-Person test as a measuring instrument is discussed in the next section.

4.3.4.2.1 Motivation for the selection of the Draw-a-Person test

The motivation for the choice of the Draw-a-Person test rests on the fact that it is the most familiar and meaningful figure for a child. It represents an index of intellectual maturity of a child rendering it an appropriate measuring instrument for this study.

The purpose of the test is to measure intellectual maturity which Harris (1963) defines as the ability to form concepts of an abstract character. The abilities involved in forming these concepts are perception (discrimination of likenesses and differences), abstraction (classification of objects) and generalisation (assigning newly experienced objects to the correct class). The evaluation of the child's drawing of the human figure serves as a way of measuring the complexity of his concept formation ability. The human figure is used because it is the most familiar and meaningful figure for the child (Sattler, 1982).

The psychometric qualities of the Draw-a-Person test are covered in the next section.

4.3.4.2.2 Psychometric properties of the Draw-a-Person test

The original standardisation involved 2,975 boys and girls from the US representative of the 1960 census. Low test-retest reliability has been determined in different studies from ,50 to ,70. Validity correlations between the Draw-a-Person test and intelligence in normal and handicapped persons range from ,24 to ,88 in different populations. Koppitz (1968) found that the Draw-a-Person test correlated significantly with the Wechsler (0,60) and Stanford-Binet (0,63) IQ scores of children aged six to seven years (Cox, 1993; Sattler, 1982).

The administration and standardisation of the Draw-a-Person test is discussed in the next section.

4.3.4.2.3 Administration and scoring of the Draw-a-Person test

The Draw-a-Person test is an easy to administer paper and pencil test. This non-verbal test can be administered individually or in a group of children from three to 15 years 11 months. The preferrred ages are three to ten years as the test loses its ability to discriminate in children older than ten years. In this study it was administered individually. There is no time limit but most children finish their drawing within 10 minutes (Koppitz, 1968).

Harris suggested the following instruction: I want you to make a picture of a man, make the best picture you can, take your time and work very carefully. Try very hard and see what a good picture you can make. Be sure to make the whole man not just the head and shoulders (Sattler, 1982).

The Goodenough-Harris scoring system was used in this study. This system is based on development. Items are listed from those frequently occurring in younger children to those less frequently occurring in older children. Each item which the child draws is scored contributing to a raw score which can be converted to an equivalent age level. In this study the raw score was used. An IQ can also be derived from the child's drawing using the Goodenough-Harris scoring system (Sattler, 1982).

The research background to the Draw-a-Person test follows.

4.3.4.2.4 Research background to the Draw-a-Person test

Brown (1983) regards the Draw-a-Person test as a culture fair test as it reflects cultural universals and language is not at its base. Cox (1993) disagrees as human figure drawings are drawn in different ways in different cultures. It has been found that in certain cultures which stress skill in representational art higher scores have been produced, as in Chinese children's drawings which are more advanced than those of children in the West (Cox, 1992). On the other hand, Bedouin children who are not encouraged to draw score poorly. Graphic symbols for people differ. In an Aboriginal group the visual symbol for a person is a semi-circle. The Bushmen draw their human figures as stick figures with pin-heads (Reuning & Wortley, 1973). A cultural difference is featured in the absence (as in the West) or presence of genitalia (Cox, 1993).

A further cultural influence on children's drawings is the influence of other children's drawings, adults' drawings and illustrations observed by the child (Cox, 1993).

Richter, Griessel and Wortley (1989) researched the Draw-a-Person test with black South African children. The figures of 415 urban black children were compared with drawings drawn by children in 1938 and 1950. They found that there was no change in the performance of children aged from five to eight years of age. Goodenough-Harris scoring was used to measure test performance on the drawings. Test performance showed a positive correlation with school achievement in children aged from five to eight years. They concluded that after eight years test performance underestimates intellectual ability.

Hagood (2003) used the Naglieri version of the Draw-a-Person test in a longitudinal study. The researcher aimed to show the appropriateness of the drawing as a measurement of cognitive development for art therapists. A total of 306 man, woman and self drawings were collected from 34 children aged five to ten years over the course of a year. The drawings showed an increase in scores over age and time. No significant sex differences emerged. The conclusion of the study was that the human figure drawing test could be a useful tool for art therapists in the assessment of cognitive development. A limitation of the study was its small sample of 34 children.

The Draw-a-Person test and gender is discussed in the following section.

4.3.4.2.5 The Draw-a-Person test and gender

Many studies have found that most children prefer to draw their own sex first. This is interpreted as an indication of the child's sex role identification. After having reviewed 19 of these studies, Heinrich and Triebe (1972), concluded that this was due to cultural reasons and not personality development.

Below the age of five years, children do not usually denote the sex of a figure. Hair style, hair length, curly hair and clothing is used to differentiate the sex of the figure. Girls tend to add more details to their drawings than do boys of the same age, thereby scoring higher. They draw their drawings taller than boys. They are more likely to use double lines for arms and legs than boys (Cox, 1993).

The measuring instruments used in this study have been discussed in this section. In the next section the intervention programme is discussed.

4.3.5 Programme of intervention

The development of the intervention programme, background information regarding characteristics of successful preschool programmes and a description of the content of the programme featured in this study is presented in this section.

4.3.5.1 The development of the programme of intervention

The intervention programme originated out of concern for children with developmental delays who do not receive remediation for their deficits which places them at risk for formal schooling. From the literature we know that children benefit from early intervention which improves their levels of school readiness and enables them to better actualize their potential (Guralnick, 1998). The intention of this study is to test whether this intervention programme is effective in improving the levels of school readiness of preschool children with delayed development.

In order to design a programme of intervention for children with delayed development a study of child development, developmental delays and the concept of school readiness was required. These aspects have been reviewed in the second chapter. A thorough knowledge of existing interventions required examination to design a comprehensive programme with a similar aim as other programmes of remediating deficits. A description of these multidisciplinary interventions was covered in the third chapter.

The following consideration in the design of a programme was to analyse what characteristics contribute to a successful preschool programme. Herbst (1989) and Short (1987) reviewed the characteristics of successful preschool programmes. These characteristics were set as aims for the design of the intervention programme used in this study:

Attainable goals within children's developmental level
Organisation of activities
Provision of an environment which encourages learning

Flexibility to adapt to the children's needs
Encouragement of a spontaneous and active attitude to learning
Discussion of children's experiences to strengthen learning
Helping the child to adjust to the social and intellectual obligations in school
Encourage optimal functioning within a group situation
Foster a positive self-image in acknowledging the children and their contributions

The programme of intervention was designed during the initial phase in the planning of the project.

Background information to the intervention programme is presented in the next section.

4.3.5.2 Background information to the intervention programme

The intervention programme used in the present study is original as it has been designed by the researcher. It is unique as there is no other known programme of its kind available.

It is similar to other preschool programmes in a number of respects. It is developmental in its theoretical framework. It is geared for children in the fourth term of their grade 0 year. The worksheets are graded according to degree of difficulty with the easiest worksheets at the beginning of the workbook. The programme is similar to other school readiness programmes as aspects of school readiness are featured.

It can be differentiated from other preschool programmes as all aspects important for school readiness as outlined in 4.3.5.3 form part of this programme. It is different from other programmes as this programme aims to improve children with fine-motor and/or language difficulties. Both fine-motor and language exercises are emphasized as these aspects are deemed as important in a group of children with language and/or fine-motor delays. This programme is convenient as it has been designed to be implemented over a structured 20 hour period. It has been specifically designed for use in the last term of grade 0. It can be used by teachers in schools and parents at home as the workbook is accompanied by an explanatory manual. It does not require apparatus. It is culture-fair.

As already mentioned children who present with delays may receive therapy for example, speech or occupational therapy to remediate their deficits. The intervention programme implemented in this study compares favourably with other therapeutic interventions. When this programme of 20 hours is compared with speech or occupational therapy for children with delays, the average therapeutic intervention totals 13 hours for a mild speech or fine-motor difficulty which amounts to 26 weeks (half a year) of weekly half hour therapy sessions. The main difference between a speech or occupational therapy programme and this intervention programme is that a speech or occupational therapy programme is individualised and this is a group intervention. A group intervention is beneficial in that more children have an opportunity to improve and the educational process is enhanced through the participation of different children.

The aim of this study is to investigate whether this intervention programme can improve the levels of school readiness of children with delayed development. If this programme were shown to contribute to improved levels of school readiness in an at risk population,

then it could be used in individual remediation or as a programme to stimulate preschool children who do not receive sufficient cognitive stimulation in a group context.
The 20 sessions of the intervention programme are described next.

4.3.5.3 The 20 sessions of the intervention programme

The intervention programme consists of 20 sessions and is based on a workbook. The programme respects the developmental level of the preschoolers in offering stimulation from a concrete level to more formal written work and discussion. The programme follows a structured series of activities session by session. Each session is designed around a particular theme aimed to stimulate vocabulary and language, eye and hand co-ordination, auditory and visual perception, alphabetical and numerical stimulation and reasoning skills. Any equivalent books can be used to elucidate the themes. The sessions of the intervention programme are not designed to co-incide with any of the items on the Revised Griffiths Scales. Any similarity is co-incidental.

The intervention programme consists of one hour sessions in the morning thrice a week for 7 weeks. The total duration is 20 hours. All the sessions are facilitated by the researcher. All learning materials for example, workbook, pencils, coloured pencils, crayons, scissors and glue are to be supplied by the researcher. The programme took place in a room where there are tables and chairs for 22 children.

Although better adult to child ratios are advised to promote individualisation of learning, the two groups of the Pretest-Posttest Control Group design were run at a teacher-child ratio of 1: 21 in the case of group 1 and 1: 22 in group 2.

The 20 sessions are summarised in Table 4.3. The description of the 20 sessions is in Appendix B. The workbook is available to the examiners. The procedure followed in the implementation of the programme is outlined in the next section.

4.3.6 Procedure

The planning for this project took place during the course of 2001. The implementation of the programme was based on the 20 sessions around which the programme was designed. As the researcher was to run the programme, this required requesting time slots of an hour three times a week, so that the programme could be completed in a term, minimising disruption.

Appointments were made with the principals of the four schools to obtain permission to possibly run the programme at their schools pending the results of the screening process. Discussion with the principals centred around educational issues. All the principals showed interest and confirmed the educational and psychological difficulties of at risk children entering formal schooling. All the principals accorded the researcher the flexibility of working directly with their pre-primary teachers.

Appointments were made with all the preschool teachers to discuss the project. Suitable days and times were finalised for the screen-testing of all the preschoolers in November 2001 scheduled to take place in the first week of the first term in 2002. The planning was finalised in the first week of the first term of 2002 when the two schools were selected for

the study after the screen-testing. The dates and times for the pre-testing of Groups 1 and 2 (second week of the first term), the implementation of the programme with Group 1 (from the second until the eighth week of the first term) and the post-testing of both groups (during the ninth and tenth weeks of the first term) were set. Dates and times for the running of the programme with group 2 in the second term were finalised at the end of the first term. This was done to comply with ethical standards so that all children could benefit from receiving the intervention and no child would be disadvantaged. Teachers were supplied with written details relevant to their groups.

After all preschoolers at the four schools were screen-tested, two schools were selected and allocated to the two groups of the Pretest-Posttest Control Group design according to random selection performed by Statcon, Department of Statistics, Rand Afrikaans University. Pre-testing commenced as soon as the letters of consent were returned. In order that the programme at the treatment school and post-testing at the two schools be completed by the end of the first term, a registered psychometrist trained in the use of the Griffiths Scales was employed to assist with pre- and post-testing. Table 4.2 shows the allocation of the groups in this study to intervention and control groups according to the Pretest-Posttest Control Group design.

Table 4.2 Random allocation of Groups 1 and 2 to intervention and control groups

	Sample	**Pre-assessment**		**Intervention**	**Post-assessment**	
	N	**Griffiths Scales**	***Draw A Person Pre-test***	**20 intervention sessions**	**Griffiths Scales**	***Draw A Person Post-test***
Group 1	**21**	✓	✓	**X**	✓	✓
Group 2	**22**	✓	✓	**-**	✓	✓
Totals	**43**	43	*43*	21	43	*43*

Reports detailing the children's levels of school readiness on the grounds of their post-test results were written and sent to the parents to inform them on the school readiness levels of their children. Copies were given to the teachers for the children's school files.

The procedure followed in the implementation of the intervention programme has been outlined. The hypotheses are discussed in the following section.

Table 4.3 Summary of the 20 sessions of the programme of stimulation

SESSION	THEME	STORY, SONG/ MUSIC	GROSS-MOTOR CO-ORDINATION	LANGUAGE	EYE-HAND CO-ORDINATION	LITERACY/ NUMERACY SKILLS
1	Me and my body	Head and Shoulders, Hokey Pokey, Knees and Toes, 12345 Once I caught a fish alive	Body parts to surroundings, movement to songs, clapping to rhythm	Who am I? Body parts Usage of parts e.g. I see with my …..	Writing name dot to dot (1-10) tracing nos (1-5)	Counting 1 - 10
2	My family	Hokey Pokey, We've got the whole world, 12 Buckle my shoe Book: Opposites		Family relationships e.g. son/daughter, aunt/uncle Opposites: e..g. old-young, big-small	Eye-hand exercise (opposites) Visual discrimination: position-in-space	Counting 1 - 10
3	Growing	The very hungry caterpillar	Movement: crawling (worm), flying (butterfly) growing etc.	Healthy foods Discussion on germinating bean plants and growing	Tracing and copying circles	Circles Days of the week
4	My home	When you're happy and you know it	Movement game: tree, 'plane, bike, table, flower, etc	Sequencing Recognising everyday sounds e.g. keys, bell, paper etc.	Tracing and copying letters with lines	Letters with lines (e.g. I,l,v) Counting 1 – 20
5	Moving	Story about moving		Address, 'Phone nos Vocabulary on	Paper folding: making a box	

				moving	Motor mazes	
6	Holidays		Movement game: stiff as a board, bunny bounce, limp as a rag etc.	Discussion on holidays	Visual discrimina-tion: figure ground Worksheet: matching shapes	Shapes Counting 1-20
7	Animals	Nursery rhymes to do with animals e.g. Mary had a little lamb, 3 little kittens, Old MacDonald, Picture Book: Animals	Animal movement game e.g. cats, birds, snakes etc.	Names of animals Auditory perception: rhyming words	Copying letters	The alphabet
8	Pets	Story: The cat in the hat		Discussion: looking after pets	Drawing lines to match rhyming words Tracing and copying nos 1-5	Letters A-D Counting 1 – 20
9	Shapes	Book: Shapes		Names of shapes Auditory perception: clap to syllables	Tracing and copying shapes Folding paper and cutting out	Shapes
10	Insects and Spiders	Nursery rhymes: Insy Winsy Spider, Little Miss Muffet Picture Book:		Auditory perception: Rhyming worksheet	Jigsaw puzzles Visual perception: Figure ground	Letters: E – I

		Insects and spiders				
11	Safety		Bean bags	Discussing consequences (picture of potential hazards) Auditory analysis: beginning, middle and end sounds Clap to syllables	Colouring in of picture	Letters: J – L
12	Hospital	Story: Going to hospital		Hospital vocabulary Auditory perception: beginning letters and analysis	Cut out + paste	Letters: M – O
13	Senses and Shopping			Auditory perception: words that start with p, q and r Discussion: Senses and money Reading packaging		Letters: P – R
14	Transport	Picture book: Transport Wheels on the bus		Vocabulary and discussion: transport, airport	Paper folding: make a 'plane Visual perception: discrimination of absurdities	Counting: 1 – 20
15	Work		Tennis balls	Discussion: work Worksheet on matching people with objects of their	Tracing and copying letters (Visual closure)	Letters: S – U

				occupations		
16	Weather and Seasons	Playtime Learning (Weather and Seasons)		Discussion and vocabulary: weather and seasons Auditory perception: end sounds of words (v-z)	Visual perception: spatial relations Cutting out and folding: making a snowflake	Letters: V – Z
17	Our country	National anthem Story: ABC with Ant & Bee		Discussion: Our country Auditory perception: Rhyming words, beginning, middle and end sounds	Copying letters Matching upper and lower case letters	Letters: A - Z Counting 1 – 20
18	Our world	Story: Round the world with Ant & Bee	Tennis balls	Discussion and worksheet: Things that are good/bad for our world Auditory perception: middle sounds (a, o)		Counting: 1 – 20
19	Space	Picture book: Space		Auditory perception: middle sounds (e, i, u)	Visual perception: position-in-space Puzzles	Counting backwards: 10 – 0
20	Going to Gr 1	Story: Going to school		Auditory Perception: Analysis	Picture: Colouring-in	Counting backwards: 10 – 1

4.4 FORMULATION OF HYPOTHESES

The formulation of hypotheses is an attempt to explain, predict and explore specific relationships between variables (Kazdin, 1980). An adequate statement of the research problem is one of the most important parts of research (Kerlinger, 1986). Hypotheses aim to state the research problem in a clear succinct way. As an essential part of science, hypotheses are powerful tools for the advancement of knowledge because the research problems they outline can be tested statistically and shown to be probably correct or incorrect, either supporting or rejecting the hypotheses (De Vos & Fouché, 1998).

The substantive hypothesis states the research problem (De Vos & Fouché, 1998). In this study the substantive hypothesis for the Pretest-Posttest Control Group design is that there will be a significant improvement in the Griffiths Scales scores of children with developmental delays between pre- and post-testing after a programme of intervention.

A statistical hypothesis is a statistical proposition which states that there is no relation between variables. The following statistical hypotheses are to be tested:

Composite hypothesis 1: There are no statistically significant differences between Group 1 and Group 2 regarding the post- minus pre-test scores of the Griffiths Scales subscales and the Draw-a-Person test.

Subhypothesis 1.1: There are no statistically significant differences between Group 1 and Group 2 regarding the post- minus pre-test scores of the Locomotor subscale of the Griffiths Scales.

Subhypothesis 1.2: There are no statistically significant differences between Group 1 and Group 2 regarding the post- minus pre-test scores of the Personal-Social subscale of the Griffiths Scales.

Subhypothesis 1.3: There are no statistically significant differences between Group 1 and Group 2 regarding the post- minus pre-test scores of the Hearing and Speech subscale of the Griffiths Scales.

Subhypothesis 1.4: There are no statistically significant differences between Group 1 and Group 2 regarding the post- minus pre-test scores of the Eye and Hand Co-ordination subscale of the Griffiths Scales.

Subhypothesis 1.5: There are no statistically significant differences between Group 1 and Group 2 regarding the post- minus pre-test scores of the Performance subscale of the Griffiths Scales.

Subhypothesis 1.6: There are no statistically significant differences between Group 1 and Group 2 regarding the post- minus pre-test scores of the Practical Reasoning subscale of the Griffiths Scales.

Subhypothesis 1.7: There are no statistically significant differences between Group 1 and Group 2 regarding the post- minus pre-test scores of the Draw-a-Person test.

Composite hypothesis 2: There are no statistically significant differences between the males in Group 1 and Group 2 regarding the post- minus pre-test scores of the Griffiths Scales subscales and the Draw-a-Person test.

Subhypothesis 2.1: There are no statistically significant differences between the males in Group 1 and Group 2 regarding the post- minus pre-test scores of the Locomotor subscale of the Griffiths Scales.

Subhypothesis 2.2: There are no statistically significant differences between the males in Group 1 and Group 2 regarding the post- minus pre-test scores of the Personal-Social subscale of the Griffiths Scales.

Subhypothesis 2.3: There are no statistically significant differences between the males in Group 1 and Group 2 regarding the post- minus pre-test scores of the Hearing and Speech subscale of the Griffiths Scales.

Subhypothesis 2.4: There are no statistically significant differences between the males in Group 1 and Group 2 regarding the post- minus pre-test scores of the Eye and Hand Co-ordination subscale of the Griffiths scales.

Subhypothesis 2.5: There are no statistically significant differences between the males in Group 1 and Group 2 regarding the post- minus pre-test scores of the Performance subscale of the Griffiths Scales.

Subhypothesis 2.6: There are no statistically significant differences between the males in Group 1 and Group 2 regarding the post- minus pre-test scores of the Practical Reasoning subscale of the Griffiths Scales.

Subhypothesis 2.7: There are no statistically significant differences between the males in Group 1 and Group 2 regarding the post- minus pre-test scores of the Draw-a-Person test.

Composite hypothesis 3: There are no statistically significant differences between the females in Group 1 and Group 2 regarding the post- minus pre-test scores of the Griffiths Scales subscales and the Draw-a-Person test.

Subhypothesis 3.1: There are no statistically significant differences between the females in Group 1 and Group 2 regarding the post- minus pre-test scores of the Locomotor subscale of the Griffiths Scales.

Subhypothesis 3.2: There are no statistically significant differences between the females in Group 1 and Group 2 regarding the post- minus pre-test scores of the Personal-Social subscale of the Griffiths Scales.

Subhypothesis 3.3: There are no statistically significant differences between the females in Group 1 and Group 2 regarding the post- minus pre-test scores of the Hearing and Speech subscale of the Griffiths Scales.

Subhypothesis 3.4: There are no statistically significant differences between the females in Group 1 and Group 2 regarding the post- minus pre-test scores of the Eye and Hand Co-ordination subscale of the Griffiths Scales.

Subhypothesis 3.5: There are no statistically significant differences between the females in Group 1 and Group 2 regarding the post- minus pre-test scores of the Performance subscale of the Griffiths Scales.

Subhypothesis 3.6: There are no statistically significant differences between the females in Group 1 and Group 2 regarding the post- minus pre-test scores of the Practical Reasoning subscale of the Griffiths Scales.

Subhypothesis 3.7: There are no statistically significant differences between the females in Group 1 and Group 2 regarding the post- minus pre-test scores of the Draw-a-Person test.

In this section the hypotheses to be tested have been set out. The statistical analysis will be discussed in the next section.

4.5 STATISTICAL ANALYSIS

The Pretest-Posttest Control Group design is used to examine the effect of a single independent variable, in this study's case, the intervention programme, across variables.

The Mann Whitney U test will be used to test the statistical significance of the differences between the post-minus pre-test central tendencies of Groups 1 and 2. The Mann Whitney U test is a non-parametric test, suitable for use when the test sample is small (less than 30). Parametric tests such as the t-test furthermore assume that populations are normally distributed whereas non-parametric tests are distribution free and do not make this assumption. Rather than being based on parameters of a normal distribution like mean and variance, the Mann Whitney statistic is based on ranks. The Mann Whitney statistic, U, is obtained by counting the number of times an observation from the group within the smaller sample size precedes an observation from the larger group (SPSS, 1999).

The statistical package used was SPSS (SPSS, 1999).

4.6 CHAPTER SUMMARY

This chapter has reviewed the motivation and aim of the study. Description of the method followed, where the research design, participants, measuring instruments and intervention were detailed to show how the research question was to be operationalised. Hypotheses were presented and how the empirical data were to be statistically analysed. The next chapter will present the quantitative results of the study.

CHAPTER FIVE

RESULTS

The previous chapter has described the implementation of the stimulation programme. The motivation for the study, goals of the research and the method were outlined. Regarding the method, the research design, the selection of the participants, measuring instruments, the programme of intervention and the procedure followed, were described. The hypotheses of the study and how the data would be statistically analysed concluded the chapter. This chapter reflects the results of the study as processed by the Statistical Consultation Service of Rand Afrikaans University using the statistical package of SPSS. In the final chapter the results will be interpreted and the study will be evaluated from Payne's (1994) model of programme evaluation and Program Evaluation Standards (Sanders, 1994).

The results of the statistical procedures performed on the data obtained for the Pretest-Posttest Control Group research design are reported in this section. The results will be presented in conjunction with the relevant tables. Section 5.1 deals with composite hypothesis 1 which is a comparison of the difference scores between the post- minus pre-tests on the Griffiths Scales subscale scores and the Draw-a-Person test scores in children with developmental delays. The results are tabulated in Table 5.1.

Section 5.2 deals with composite hypothesis 2 which is a comparison of the difference scores between the post- minus pre-tests on the Griffiths Scales subscale scores and the Draw-a-Person test scores for male children with developmental delays. The results are tabulated in Table 5.2.

Section 5.3 deals with composite hypothesis 3 which is a comparison of the difference scores between the post- minus pre-tests on the Griffiths Scales subscale scores and the Draw-a-Person test scores for female children with developmental delays. The results are tabulated in Table 5.3.

5.1 RESULTS OF THE EFFECT OF THE INTERVENTION PROGRAMME ON THE GRIFFITHS SCALES AND DRAW-A-PERSON SCORES FOR GROUPS 1 AND 2 (H 1)

Composite hypothesis 1 is a comparison of the difference scores between the post- minus pre-tests on the Griffiths Scales and Draw-a-Person test in children with developmental delays. The results of the Mann-Whitney U test for subhypotheses 1.1 to 1.7 are presented in Table 5.1, along with the z score and level of significance.

Table 5.1 shows:

- that there are significant differences between the experimental and control groups on the Locomotor subscale for children with developmental delays (p = 0, 026), but these are in the wrong direction

- that there are significant differences at the 10 % level of significance between the experimental and control groups on the Personal-Social subscale (p = 0,064) for children with developmental delays

- that there are no significant differences between the experimental and control groups on the Speech and Hearing subscale for children with developmental delays

- that there are significant differences between the experimental and control groups at the 1 % level of significance on the Eye and Hand Co-ordination subscale (p=0,003) for children with developmental delays

- that there are no significant differences between the experimental and control groups on the Performance subscale for children with developmental delays

- that there are no significant differences between the experimental and control groups on the the Practical Reasoning subscale for children with developmental delays

- that there are significant differences at the 1 % level of significance between the experimental and control groups on the Draw-a-Person test (p = 0,005) for children with developmental delays

Null hypotheses are thus accepted for subhypotheses 1.3, 1.5 and 1.6. The null hypotheses for subhypotheses 1.1, 1.2, 1.4 and 1.7 are rejected as differences were apparent.

Table 5.1 Significance of difference between Group 1 and Group 2 regarding scores on post- minus pre-tests

Variable	Group	N	X	SD	Mean rank	Sum of Ranks	Mann-Whitney	Z	p-value and significance
Griffiths Locomotor Subscale	1 2	21 22	4.00 11.45	9.61 9.71	17.64 26.16	370.50 575.50	139.50	-2.23	0.026**
Griffiths Personal-Social Subscale	1 2	21 22	4.19 -2.36	9.62 12.48	25.62 18.55	538.00 408.00	155.00	-1.85	0.064 *
Griffiths Speech and Hearing Subscale	1 2	21 22	12.67 7.14	11.96 10.56	25.14 19.00	528.00 418.00	165.00	-1.61	0.108
Griffiths Eye-Hand Co-ordination Subscale	1 2	21 22	11.71 2.14	9.89 10.95	27.74 16.52	582.50 363.50	110.50	-2.94	0.003 ***
Griffiths Performance Subscale	1 2	21 22	6.00 8.81	10.29 15.89	20.00 23.91	420.00 526.00	189.00	-1.02	0.307
Griffiths Practical Reasoning Subscale	1 2	21 22	5.71 8.04	7.71 12.32	22.88 21.16	480.50 465.50	212.50	-0.45	0.652
Draw-a-Person	1 2	21 22	1.33 -1.27	2.63 2.73	27.52 16.73	578.00 368.00	115.00	-2.84	0.005 ***

* 10 % level of significance
** 5 % level of significance
*** 1 % level of significance

5.2 RESULTS OF THE EFFECT OF THE INTERVENTION PROGRAMME ON THE GRIFFITHS SCALES AND DRAW-A-PERSON SCORES FOR MALE CHILDREN IN GROUPS 1 AND 2 (H2)

Composite hypothesis 2 is a comparison of the difference scores between the post- minus pre-tests on the Griffiths Scales and Draw-a-Person test in male children with developmental delays. The results of the Mann-Whitney U test for subhypotheses 2.1 to 2.7 are presented in Table 5.2, along with the z score and level of significance.

Table 5.2 shows:

- that there are no significant differences between the experimental and control groups on the Locomotor subscale for male children with developmental delays
- that there are no significant differences between the experimental and control groups on the Personal-Social subscale for male children with developmental delays
- that there are significant differences at the 5 % level of significance between the experimental and control groups on the Speech and Hearing subscale ($p = 0.047$) for male children with developmental delays
- that there are significant differences between the experimental and control groups at the 5 % level of significance on the Eye and Hand Co-ordination subscale ($p = 0,032$) for male children with developmental delays
- that there are no significant differences between the experimental and control groups on the Performance subscale for male children with developmental delays
- that there are no significant differences between the experimental and control groups on the the Practical Reasoning subscale for male children with developmental delays
- that there are significant differences at the 5 % level of significance between the experimental and control groups on the Draw-a-Person test ($p = 0.044$) for male children with developmental delays

Null hypotheses are thus accepted for subhypotheses 2.1, 2.2, 2.5 and 2.6. The null hypotheses for subhypotheses 2.3, 2.4 and 2.7 are rejected as differences were apparent.

Table 5.2 Significance of difference between Group 1 and Group 2 regarding scores on post- minus pre-tests for male children

Variable	Group	N	Average	Std Dev	Mean Rank	Sum of Ranks	Mann-Whitney	z	P value and significance
Griffiths Locomotor Subscale	1 2	15 14	3.80 10.14	10.33 11.13	13.07 17.07	196.00 239.00	76.00	-1.27	0.205
Griffiths Personal-Social Subscale	1 2	15 14	3.00 -5.36	10.68 11.60	17.30 12.54	259.50 175.50	70.50	-1.51	0.131
Griffiths Speech and Hearing Subscale	1 2	15 14	14.40 6.36	13.09 9.88	18.03 11.75	270.50 164.50	59.50	-1.99	0.047 **
Griffiths Eye and Hand Co-ordination Subscale	1 2	15 14	9.80 1.64	9.99 13.33	18.27 11.50	274.00 161.00	56.00	-2.15	0.032 **
Griffiths Performance Subscale	1 2	15 14	6.47 6.71	10.84 18.08	14.53 15.50	218.00 217.00	98.00	-0.31	0.760
Griffiths Practical Reasoning Subscale	1 2	15 14	4.93 8.29	7.62 13.80	16.23 13.68	243.50 191.50	86.50	-0.81	0.418
Draw-a-Person	1 2	15 14	0.867 -1.36	2.69 2.65	18.07 11.71	271.00 164.00	59.00	-2.02	0.044 **

* 10 % level of significance
** 5 % level of significance
*** 1 % level of significance

5.3 RESULTS OF THE EFFECT OF THE INTERVENTION PROGRAMME ON THE GRIFFITHS SCALES AND DRAW-A-PERSON SCORES FOR FEMALE CHILDREN IN GROUPS 1 AND 2

Composite hypothesis 3 is a comparison of the difference scores between the post- minus pre-tests on the Griffiths Scales and Draw-a-Person test in female children with developmental delays. The results of the Mann-Whitney U test for subhypotheses 3.1 to 3.7 are presented in Table 5.3, along with the z score and level of significance.

Table 5.3 shows:

- that there are significant differences between the experimental and control groups on the Locomotor subscale at the 10 % level of significance (p = 0,052) but these are in the wrong direction

- that there are no significant differences between the experimental and control groups on the Personal-Social subscale

- that there are no significant differences between the experimental and control groups on the Speech and Hearing subscale

- that there are significant differences between the experimental and control groups at the 1 % level of significance on the Eye and Hand Co-ordination subscale (p = 0.008)

- that there are no significant differences between the experimental and control groups on the Performance subscale

- that there are no significant differences between the experimental and control groups on the the Practical Reasoning subscale

- that there are significant differences between the experimental and control groups on the Draw-a-Person test at the 1 % level of significance (p = 0,027).

Null hypotheses are thus accepted for subhypotheses 3.2, 3.3, 3.5 and 3.6. The null hypotheses for subhypotheses 3.1, 3.4 and 3.7 are rejected as differences were apparent.

Table 5.3 Significance of difference between Group 1 and Group 2 regarding scores on post- minus pre-tests for female children

Variable	Group	N	X	SD	Mean Rank	Sum of Ranks	Mann-Whitney	z	P value and significance
Griffiths Locomotor Subscale	1 2	6 8	4.50 13.75	8.36 6.58	5.00 9.38	30.00 75.00	9.00	-1.94	0.052 *
Griffiths Personal-Social Subscale	1 2	6 8	7.17 2.88	5.98 12.97	8.83 6.50	53.00 52.00	16.00	-1.04	0.300
Griffiths Speech and Hearing Subscale	1 2	6 8	8.33 8.50	7.79 12.25	7.67 7.38	46.00 59.00	23.00	-0.13	0.897
Griffiths Eye and Hand Co-ordination Subscale	1 2	6 8	16.50 3.00	8.55 5.32	10.92 4.94	65.50 39.50	3.50	-2.66	0.008*
Griffiths Performance Subscale	1 2	6 8	4.83 12.50	9.60 11.24	5.92 8.69	35.50 69.50	14.50	-1.23	0.219
Griffiths Practical Reasoning Subscale	1 2	6 8	7.67 7.63	8.31 10.08	7.00 7.88	42.00 63.00	21.00	-0.40	0.696
Draw-a-Person	1 2	6 8	2.50 -1.13	2.26 3.04	10.33 5.38	62.00 43.00	7.00	-2.21	0.027 **

* 10 % level of significance
** 5 % level of significance
*** 1 % level of significance

5.4 CONCLUSION

The primary aim of the study in examining the efficacy of the intervention programme in improving developmental difficulties yielded significant statistical results.

In the quantitative analysis of the Pretest-Posttest Control Group design, it was proven that the children who received this intervention programme performed better than children who received regular education within a quality preschool environment in terms of the Personal-Social and Eye-Hand Co-ordination subscales and the Draw-a-Person. The Eye and Hand Co-ordination subscale of the Griffiths Scales and the Draw-a-Person test consistently proved sensitive to the aim of the study. With regards to the Locomotor subscale of the Griffiths Scales the control group showed greater improvement than the experimental group.

With regards to the male children positive statistical results were shown on the Speech and Hearing and Eye-Hand Co-ordination subscales of the Griffiths Scales and the Draw-a-Person test.

The female children showed positive statistical results on the Eye-Hand Co-ordination subscale of the Griffiths scales and the Draw-a-Person test. Negative results were obtained on the Locomotor subscale of the Griffiths Scales for female children.

The results will be discussed and evaluated from a programme evaluation perspective and by applying Program Evaluation Standards established by the Joint Committee on Standards for Educational Evaluation in the next chapter. The results will be integrated with the rest of the study. Finally, recommendations and limitations of the study will be shared.

CHAPTER SIX

DISCUSSION OF RESULTS, PROGRAMME EVALUATION, LIMITATIONS OF THE STUDY, RECOMMENDATIONS AND CONCLUSION

The statistical results of the study were reported in the previous chapter. In this final chapter the results will be discussed and integrated with the literature presented. The study will be evaluated from a programme evaluation perspective and according to criteria established by the Joint Committee on Standards for Educational Evaluation. In conclusion, recommendations and limitations will be shared.

The next section discusses the results of the study.

6.1 DISCUSSION OF RESULTS

Statistical results showed that the intervention programme was consistently effective in improving the Eye and Hand Co-ordination subscale of the Griffiths Scales and the Draw-a-Person test scores of all the children with developmental delays, of the male children with developmental delays and of the female children with developmental delays.

Many preschool programmes exist but most do not address delayed development. Very few preschool programmes have been put to scientific scrutiny. This project involved the design of an intervention programme to improve the abilities of preschool children with delayed development, and the testing and evaluation of this programme using a research design.

This study has demonstrated the effectiveness of an intervention programme in improving the visual-motor co-ordination skills and intellectual maturity (Goodenough, 1926; Harris, 1963; Richter, Griessel & Wortley, 1989) in a group of preschool children with developmental delays.

Remediation within a group has been demonstrated successfully in this intervention study. This is cost-effective in terms of resources and time. Group intervention complements our OBE approach in education and enables more children to receive the help they need especially as there are so many children who enter formal education at risk (Luiz, 1999). Donald, Lazarus and Lolwana (2002) view developmental delays as barriers to learning. In order for children to actualize their potential, barriers to learning need to be eliminated as much as possible.

This study corroborates Cloete and Kok's (1988) main finding in which similar results regarding eye and hand co-ordination were obtained. Their combined grade 1 boys and girls experimental group also showed an improvement in visual-perceptual-motor ability. According to Grové (1984) visual-motor co-ordination is an important aspect of school readiness.

The Draw-A-Person proved consistently sensitive in showing statistically significant differences in scores for the combined group of children, and for the male and female children with developmental delays. According to Goodenough (1926), Harris (1963) and Richter, Griessel and Wortley (1989), the Draw-a-Person reveals the progression in intellectual development toward greater conceptual complexity and maturity. The stimulation programme was thus successful in improving the intellectual maturity of the children. This result of demonstrating a programme able to enhance cognitive ability has been demonstrated in many other international and local studies for example, the Cognitive Curriculum for Young Children (Haywood, Brooks & Burns, 1991) and Herbst's (1989) stimulation programme. This confirmation strengthens the value of stimulation programmes in the development of children, especially in children with developmental delays.

A rationale for early intervention is that initial patterns of learning and behaviour that influence all later development are established during the early years. Research has shown certain critical periods when a child is more susceptible and responsive to early learning experiences (Guralnick, 1998). Grafman and Salazar (1995) explain that different neural networks are stimulated so that relocalisation of function can occur (Temple, 1997). The results of this study show that the preschool stage of development may well be one of these critical times when children are susceptible to intervention. Piaget (1963) called the preschool stage of development the second stage of the preoperational or symbolic stage. From the age of five to around seven years of age, children use more social speech and rely more on intuitive thinking rather than perception alone. Early intervention programmes have been shown more effective in helping a child with delayed development rather than remedial assistance at primary or high school level (McCormick & Hickson, 1996).

The positive results gained as a result of the intervention programme confirm the effectiveness of an instructivist perspective in child development. Contemporary curriculum models are based on developmentally appropriate practice and the acquisition of functional skills to prepare the child for the future demands of formal education (Bailey, 1997). Models can be constructivist, instructivist or a combination of the two perspectives. This intervention programme encompasses vocabulary and language, eye and hand co-ordination, visual and auditory perceptual training, numerical and alphabetical stimulation and reasoning skills. The success of the intervention programme endorses the effectiveness of the instructivist curriculum model in helping children with delayed development improve their abilities. The mediation received in an instructivist programme of intervention is an endorsement of Vygotsky's (1978) theory of cognitive development in which learning is socially mediated. Snow, Burns and Griffin (1998) have shown that children with lower cognitive ability prior to an intervention showed better gains in language development from mediated instruction. The children in this sample were selected on the grounds of their screen-test results being below the 50^{th} percentile. The research by Snow, Burns and Griffin (1998) supports the mediated instruction used in this intervention. Although this instructivist programme was successful in improving the abilities of the children with delayed development, many educationalists for example, Katz (1999b) stress the value of play in a full-time preschool environment.

Contemporary theories of child development emphasize the dynamic interaction of the child with the environment (Bronfenbremmmer, 1979) as opposed to the child who

matures passively (Gardner, 1982). The bi-directional interaction of the intervention with the children mirrors Bronfenbremmer's (1979) theory of development in which the child is viewed as interacting dynamically with the environment. The children who received the intervention and improved their abilities is an endorsement of the interactional theory of development. This interactional model views delayed development as arising from faulty learning during an earlier period of development (Williams, 1999). That this intervention programme was successful in improving the abilities of children with delayed development shows that faulty learning during an earlier stage (Williams, 1999) can be remediated thus supporting the rationale for intervention and giving further impetus to intervention research in the area of preschool education.

The valuable role parents can play in the development of their children has been documented (Clarke and Clarke, 2003). Pelletier and Brent (2002) add that school readiness is a developmental task of adaptation for both the child and the parents. Talks given to the parents of the children may have contributed to their greater involvement in their children.

The intervention programme was also successful in improving the personal-social abilities in the combined male and female group. These skills are deemed important for the successful adaptation to formal schooling (Meisels, 1999) and can be viewed as contributing to the general school readiness abilities of all the children.

The biological (Gardner, 1982) and sociological (Beckett, 2002) perspectives in gender development play a fundamental role in the establishment of gender identity in the young child. In this study gender differences were apparent.

With regard to the male children, positive statistical results were demonstrated on the Speech and Hearing and Eye and Hand Co-ordination subscales of the Griffiths Scales and the Draw-a-Person test. With regard to female children, positive statistical results were shown on the Eye and Hand Co-ordination subscale of the Griffiths Scales and the Draw-a-Person test.

It can be concluded that the male children benefitted more from the intervention than the female children. A possible reason for this is that more boys than girls are identified with learning difficulties at school (Kolb & Whishaw, 2003) which accounts for a lower baseline enabling better improvement than a higher baseline. This can be attributed to differences in brain physiology (Hyde & McKinley, 1997). Males are reported to have greater spatial and mathematics ability and females, greater verbal ability (Kolb & Whishaw, 2003). Stackhouse (2001) has shown that children with difficulties with oral speech and language go on to have major difficulties with literacy once they are at school. Brant and Holt (1986) have noted that language development in girls is superior to that of boys. Kolb and Whishaw (2003) have reported that girls develop larger vocabularies and use linguistically more complex constructions. These facts may account for the males' improvement on the Speech and Hearing subscale as opposed to the girls who already had better developed language ability. If this programme of intervention has improved the school readiness abilities of boys, it can be regarded as a valuable and timeous tool in preventing children, especially males, from being at risk for education (Guralnick, 1998), especially in the light of the already mentioned tendency of more boys who experience learning difficulties than girls (Kolb & Whishaw, 2003).

A negative result emerged with regard to the Locomotor scale of the Griffiths Scales. This scale measures gross-motor co-ordination. The combined group of male and female children and the male and female children separately in the control group showed a better improvement than the children in the experimental group. This may be accounted for by the fact that the intervention programme addressed fine-motor co-ordination more than gross-motor co-ordination and that the children of the control group had a much larger play ground, separate from the rest of the primary school; participated in swimming and physical education classes with the school sports' teachers and there was a large jungle-gym for the children to play on. At School 1 the playground was small, there was no jungle gym and the children did not participate in swimming or physical education classes with the school sports' teachers. The fact that other researchers for example, Behr (1997) and Briedenhann (1998) have demonstrated positive results in improving gross-motor co-ordination as a result of their specifically directed gross-motor intervention programmes confirms that locomotor function in children can be improved.

Better locomotor scores in the male children rather than female children may have been expected as boys are generally more physically active than girls and girls are more sedate than boys (Collaer & Hines, 1995). This gender difference was not apparent in this study for the already mentioned reason that the intervention programme directed its focus more on fine-motor co-ordination than on improve gross-motor co-ordination.

It can thus be concluded that this programme improves school readiness, supplements the school curriculum and that it may be useful in the home-schooling educational arena.

The next section discusses programme evaluation.

6.2 PROGRAMME EVALUATION

A definition and an explanation of programme evaluation introduces this section. Reasons for programme evaluation and evaluation approaches will be outlined. The intervention programme is then evaluated from two perspectives: an eclectic programme evaluation method and from the criteria of the Program Evaluation Standards (Sanders, 1994).

6.2.1 Introduction

Rossi and Freeman (1982) define evaluation research as the systematic application of social research procedures for assessing the conceptualisation, design, implementation, and utility of social intervention programmes. This process involves the application of the scientific method in a cyclical and sometimes linear way.

Evaluation and research differ with regard to the expected use or utility of the data. Programme evaluation provides a basis for making this comparison (Royse, Thyer, Padgett & Logan, 2001).

For instance, the purpose of evaluating a programme may be to make judgements of merit or worth (summative), to improve a programme (formative) or to generate knowledge. Judgment-oriented programme evaluation examines how and why a change programme does or does not work. Summative evaluation offers an overall decision at the end of the process for accountability purposes (Babbie & Mouton, 1998).

Most projects use formative and summative evaluation but for different reasons. Informal measures can be used in formative evaluation whereas more valid and objective data are required in summative evaluation (Payne, 1994).

Evaluators have responsibilities to the participants, their parents (in the case of children), and the community. Too many programmes are in existence without having been put to scientific scrutiny and whether these programmes are valuable or not, is not known. One of the easiest ways evaluation can contribute to the generation of knowledge is pure description. Documentation assists in understanding how the programme was implemented and if proven worthwhile, it can be replicated. According to Payne (1994) evaluation of educational programmes is without doubt essential.

When an innovative intervention is evaluated from a programme evaluation perspective, this form of evaluation is called intervention research (Rubin & Babbie, 2001). This programme evaluation may be regarded as intervention research.

6.2.2 Reasons for progamme evaluation

In an effort to improve the conceptualisation, design, planning, administration, implementation, effectiveness, efficiency and utility of this intervention, it was evaluated from a programme evaluation perspective (Rubin & Babbie, 2001).

Programme evaluation integrates research and practice skills. All practitioners in the human services strive to help their clients in the best possible way. Knowledge of programme evaluation provides one with the skills in judging the value of potentially useful published programmes for the helping professions (Royse et al., 2001).

6.2.3 Approaches to programme evaluation

Many different models of programme evaluation have been documented. A model is a conceptual paradigm, flowchart or schematic representation of ways of thinking about a subject (Payne, 1994).

Payne (1994) differentiates four metaphors that have evolved into four general approaches to programme evaluation namely, the judicial, anthropological, consumer and management metaphors. Which approach is chosen is determined by the finances available, the nature of evaluation objectives, the personalities of evaluators and stakeholders, and the political climate.

The management evaluation metaphor is an appropriate metaphor for this study as it is based on school management functions: collecting information, planning, communicating, decision-making, implementing and evaluating. An example of this framework is the CIPP (Context, Input, Process and Product) approach developed by Stufflebeam (1983). This framework has been applied to this study and is represented in table 6.1.

The CIPP approach begins with a Context evaluation in which needs are defined and goals are set. The actual programme is evaluated in terms of whether it serves the goals. The Input evaluation examines alternative designs and assesses cost, benefit, implementation,

and advantages and disadvantages. The Process evaluation concentrates on the monitoring of the implementation. The Product evaluation assesses outcomes. CIPP-like frameworks are suggested when objectives and tasks associated with planning and implementing programmes are to be assessed and when decisions need to be taken (Payne, 1994).

A similar comprehensive model of programme evaluation developed by Payne (1994) is outlined in figure 6.1. The nature of activities and sequence of steps in the evaluation process depends on the approach, methodology, kind of evaluation questions being asked, availablity of resources and time.

Thomas and Rothman (1994) have added a valuable step in the evaluation process omitted in Payne's (1994) design. They emphasise the early development and pilot testing phase which precedes the evaluation and advanced development phase of the design. The study of programme theory, the literature regarding the proposed area of study and a comparison of alternative programmes is suggested as this has implications for the potential success of the project. Regarding process evaluation, the first question to pose is, is the intention of the project appropriate to the problem it wishes to address. Louw (2000), Payne (1994), and Thomas and Rothman (1980) also suggest an on-going process evaluation to ensure that the treatment succeeds.

These are some of the ways to evaluate a programme. In the next section this study is evaluated using a general framework of steps as outlined in figure 6.1.

Table 6.1 Adapted Evaluation Management Plan using CIPP Question Categories (Merriman, 1972)

Phase **Component**	**Identification of Information Needs**	**Decision Rule Criteria**	**Information System Specifics**	**Data Collection**	**Data Organisation and Reduction**	**Data Storage and Retrieval**	**Data analysis**	**Reporting**
CONTEXT **Does intervention improve at-risk children's abilities?**	Delayed development Cost-effectiveness	Disparity between delayed development and school readiness	Sources Type of information Time requirements Criticality Sample requirements Quantity Accessibility	Standardised tests: Screentesting: (Sonnekus & Le Roux) Pre-testing & Post-testing: Griffiths Scales Draw-a-Person Biographical Questionnaire	Manual	Manual Computerised data bank	Quantitative: Statistical analysis using SPSS	Formal report: written thesis school readiness assessment reports Informal report: oral (one to one and group)
INPUT **Procedures selected to reach goals** **Alternative designs** **Cost benefit** **Implementation time constraints**	Available solutions to solve this issue Data on prior solutions Relationship to context	Feasibility Sufficiency Validity Viability Barriers Tensions Cost-effectiveness	Sources Type of Information Time requirements Criticality Sample requirements Quantity Accessibility	Review of literature Interviews with principals, teachers & parents	Manual	Manual Computerised data bank	Statistical analysis using SPSS	Formal and informal reports
PROCESS **Implementation of programme**	Barriers to success Implementation difficulties	Acceptability Utilisation Integration Assimilation	Sources Type of information Time requirements Criticality Sample requirements Quantity Accessibility	Logs Observations Interviews Questionnaires Action research	Manual	Manual Computerised data bank	Statistical analysis using SPSS	Formal and informal reports
PRODUCT **Outcomes in relation to goals**	Project outcomes: Achievement levels Attitudes Cost-effectiveness	Desired achievement Desired attitudes	Sources Type of Information Time requirements Criticality Sample requirements Quantity Accessibility	Screentest results Griffiths Scales results Analysis of action research, questionnaires, interviews & observations	Manual	Manual Computerised data bank	Statistical analysis using SPSS: Pre--post results Experimental-control	Tabular Descriptive Statistical

6.2.4 Discussion of the intervention programme from a programme evaluation perspective

The evaluation of the programme of stimulation designed to improve the abilities of preschoolers follows. The programme is evaluated from an eclectic programme evaluation perspective based on Payne's (1994) evaluation process. The programme is evaluated following the main stages in programme evaluation: a needs analysis, programme goals and evaluation objectives, research design selection, data collection and analysis, results and cost-effectiveness.

6.2.4.1 Needs analysis

Royse et al. (2001) regard the first step in the planning process as involving needs analysis. Needs analysis includes determining potential clients, their geographical distribution, socio-demographic characteristics, the marketing of the intervention to inform prospective clients, and an assessment of the quality and accessibility of existing services.

Needs analysis assists in selecting problems on which to focus resources. Needs can be defined as those things without which, or without a sufficient amount of which, a negative or undesirable state occurs (Lipsey, Wilson, Shayne, Derzon & Newborough, 1996). Needs analysis is carried out by using one or more of the following approaches: surveying key informants, holding a community forum, examining current programmes and their outcomes, conducting a direct survey of a target group, census data and epidemiological surveys (Louw, 2000; Royse et al., 2001).

Adequate needs analysis was done in the case of this study by way of identifying an area of need and researching this through the literature and within the school community.

After the needs assessment is complete and a programme has been proposed, programme goals and evaluation objectives are specified. These are discussed in the next section.

6.2.4.2 Programme goals and evaluation objectives

De Vos (1998c) suggests an evaluability assessment to determine whether a programme can be implemented or not. This initial assessment is akin to a qualitative pilot testing in that information is obtained from interviews, and testing of alternatives and their outcomes is performed. Evaluability can be assessed quantitatively by assessing the conceptualisation and administrative structure for the handling of the programme. There are numerous advantages to an evaluability assessment. Correct conceptualisation and standardized treatment are assured.

The process of researching an intervention can be facilitated by using data collection management charts such as Programme Evaluation and Review Technique (PERT). A PERT chart depicts the flow of events over time in implementing a project. A data management plan enables the evaluator to see the whole design at a glance (Payne, 1994). An example of the PERT chart used in this study can be seen in figure 6.2. The PERT chart was advantageous in organising the objectives over the time frame.

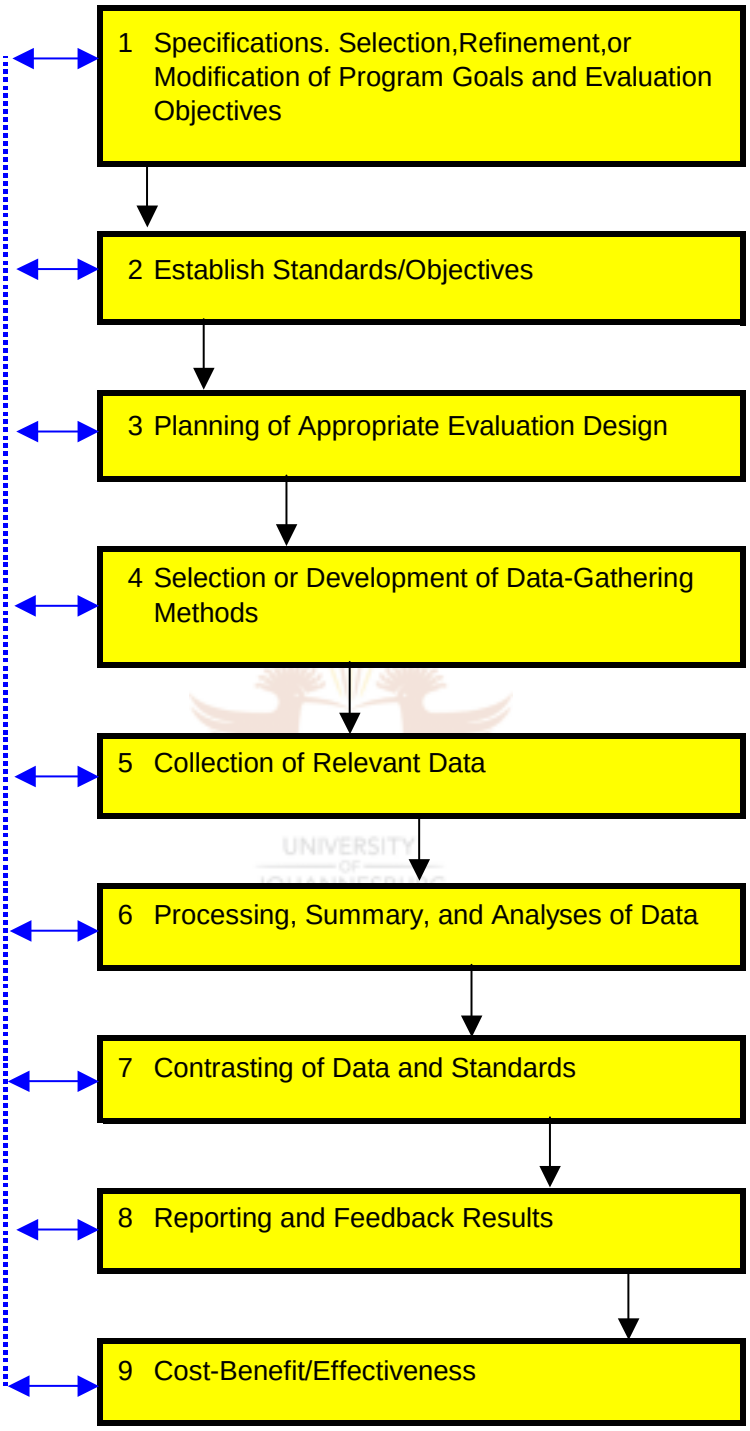

Figure 6.1 Overview of usual activities in the evaluation process (Payne, 1994)

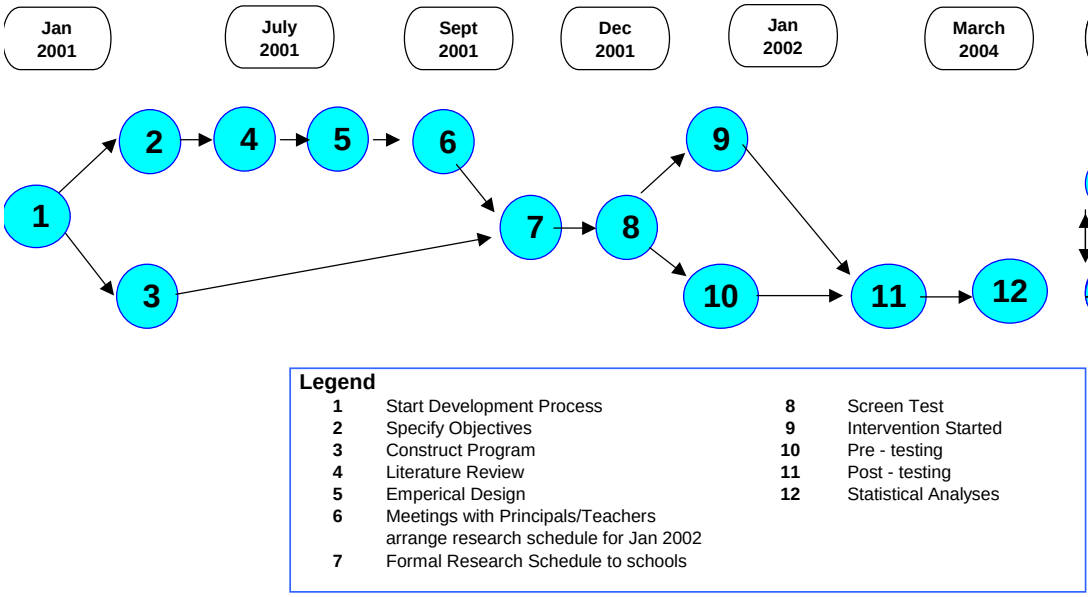

Figure 6.2 Adapted Programme Evaluation and Review Technique (PERT) (Payne, 1994)

6.2.4.3 Research design selection

In this section the selection of the research design will be evaluated.

The three categories of research designs (experimental, quasi-experimental and non-experimental) differ in the degree of control over the treatment. The intent is to equate groups so that all start on the same footing and that potential variables that might influence are controlled (Payne, 1994).

Payne (1994) cautions that an educational intervention may not generalise to all settings because the original setting can never be replicated because of the human factor. For example, unintended effects may have resulted from conducting the study in the first term at the preschoolers' new school (Payne, 1994).

A quantitative method was used to measure the objective measureable variable of improvement of scores on the Griffiths Scales.

The allocation of subjects in this Pretest-Posttest Control Group design used in this study was deviated from in that subjects were not randomly assigned to groups. Although the two schools were allocated randomly to the treatment and non-treatment groups, they do differ on other non-controllable variables, such as teacher characteristics, teacher competencies, the school curriculum and socio-economic variation between child and residential areas. Control of treatment could have been compromised in the study due to these factors.

Threats to external and internal validity (discussed in detail under 4.3.1.4 and 4.3.1.5) and any other intercations can influence design. Maturation, statistical regression, diffusion or imitation of treatments might have influenced this programme's results although due care was exercised to minimize these effects (Payne, 1994).

The evaluation of the choice of research design used in this study has been discussed in this last section. An evaluation of the methods of data collection and the analysis of data are evaluated in the next section.

6.2.4.4 Data collection and analysis

Methods of data gathering need to be decided upon. The selection of data collection methods is determined by the research design. Programme evaluation necessitates a study of the most appropriate quantitative methods.

Payne (1994) encourages the collection of high quality data. Six characteristics of high quality data are relevance, balance, efficiency, objectivity, reliability and fairness. Relevance is the degree to which measurement is an accurate reflection of the variable of interest. The Group Test for the Evaluation of School Readiness and the Griffiths Scales are both tests of high construct validity in that they measure school readiness. Balance is reflected in the different aspects of school readiness measured by the two tests respectively. Efficiency is the balance between the time available to collect the data, cost, requirements for scoring and reporting, and the relevance of the collected data. Objectivity refers to the objective interpretation of the scoring or meaning attributed to the observations. Consistency of measurement contributes to reliability. Fairness applies to freedom from bias, and fair testing (Payne, 1994).

A researcher can take cognisance of these many salient points in selecting the most effective ways of collecting data, but discrepancies between the programme-as-designed and programme-as-delivered need to be identified to maximise the chances that a project will succeed. A potentially effective intervention may fail if the integrity of treatment is compromised (Louw, 2000). This point is applicable in the case of this study as had a pilot study been run before the implementation of the stimulation programme, the integrity of the intervention might have been greater.

According to Louw (2000) weak implementation is often identified as a reason for a programme to fail. The programme may not have been implemented over a long enough period. It may have been more effective in improving the levels of school readiness in the children had it been implemented over a longer period of time.

Data analysis is an ongoing cyclical process (McGee-Brown, 1994).

Table 6.2 Adapted Data Management Plan for the Study (Payne, 1994)

FOCUS/ Evaluation Question	Instrument/ Variable	Data Source	Level	Experimental and/or Contrast Group	Collection Point	Responsible Person	Analysis Procedure
ONE (Achievement)	Screentesting (Sonnekus & Le Roux)	Learners at 4 schools	Gr 0	Experimental (Group 1) & control (Group 2) groups	1st week of 1st term	Project co-ordinator	Lowest scores at 2 schools
	Griffiths Scales Pre-testing	Learners Groups 1 + 2	Gr 0	Groups 1 + 2	3rd - 4th week of 1st term	Project co-ordinator	Mann-Whitney Z
	Griffiths Scales Post-testing	Learners Groups 1 + 2	Gr 0	Groups 1 + 2	Last 2 weeks of 1st term	Project co-ordinator	Mann-Whitney Z

6.2.4.5 Results

This section evaluates to what extent the results are appropriate and effective in realising the objectives of the study.

Results involve the measured and/or observed outcomes of the programme and the long-term impacts observable at community level. Outcomes need to be realised before an impact is noticed. Outcomes can be monitored during the intervention and may lead to essential adjustments to ensure the overall success of the programme. Failure to recognise warnings may cause the programme to fail (De Vos, 1998c; Louw, 2000).

Evaluating results in the educational arena poses different challenges from a quantitative perspective. Authentic assessment is recommended as a way of measuring outcomes in education. It aims to strengthen the connection between instruction, learning and measurement. It is an outcomes-based approach based on what skills learners have, and what problems they can solve. There is an emphasis on higher order thinking skills (Payne, 1994). The Griffiths Scales used in this study measure skills and are regarded as an appropriate method of obtaining authentic quantitative results in children (Luiz et al., 2001).

The actual programme of stimulation requires an assessment of its educational worth. Payne (1994) has put forward the following criteria which need to be considered in the evaluation of educational material:

General and instructional objectives should be available. Relevant problem-solving and creative skills should be addressed. The organisation of the material should follow some conceptually developed pattern and the sequence should be in line with individual or system needs. A variety of approaches or media should be used. The instructional intent should meet the readiness of the learner. Procedures should be provided to assess the learner's progress. The cost, appearance and attractiveness to the teacher and learner should be considered. All suggested extra material should be easily accessible (Payne, 1994). These criteria were taken into consideration in the design of the programme.

6.2.4.6 Cost effectiveness

The last aspect of process evaluation concerns the cost-benefit equation. Cost-effectiveness deals with how programme outcomes compare with the cost of the programme (De Vos, 1998c).

The effort of evaluation must be weighed up against its utility, to what extent it is effective and cost-efficient. The evaluation may provide certain findings of use to other evaluators or professionals which may influence the science of programme evaluation or develop the field of study (De Vos, 1998c).

No financial outlay is required to implement this programme. The usual preschool teaching media for example, books and puzzles, and materials for example, paper, crayons, scissors, are available in an equipped preschool. The programme is cost-effective and easy to implement.

In this section the programme of stimulation has been evaluated using a framework for programme evaluation. From a programme evaluation perspective the stimulation programme has been assessed as having both positive and negative aspects. The programme is cost-effective, enjoyable and usuable. However, pilot testing was not done and would have enabled the researcher to plan more effectively to maximize the success of the programme.

Criteria for evaluation practice are outlined in the next section.

6.2.5 Criteria for evaluation practice

Another method of evaluating a programme is by using the criteria established by the Joint Committee on Standards for Educational Evaluation. The criteria are known as the Program Evaluation Standards and are adhered to by users and producers of programmes. The criteria can be used to help design an evaluation or evaluate an already completed study. They represent the professional standards for and serve to govern the profession of evaluators. The criteria are outlined below:

General design criteria include the comprehensiveness of the evaluation, the relevance of the data to the objectives, flexibility and feasibility of the design. Replicability, objectivity and representativeness are required in the section of data collection and processing. Criteria relating to the reporting, presentation and communication and ethical professional behaviour are included in the evaluation. Evaluation of a programme according to these criteria enable each section and subpoints to be rated concluding with a final recommendation (Payne, 1994; Sanders, 1994).

The next section evaluates the stimulation programme using the criteria of the Joint Committee on Standards for Educational Evaluation.

6.2.6 Evaluation of the intervention programme according to the Program Evaluation Standards

The Program Evaluation Standards were utilised to evaluate the programme (Sanders, 1994)

6.2.6.1 Clarifying the purpose of the evaluation

So many preschool programmes exist that have not been scientifically validated. The researcher wished to put this programme to the test to verify whether it is effective or not and if found wanting, to recommend changes to improve its worth (Sanders, 1994).

6.2.6.2 Description of the intended evaluation activities

The researcher assumed the role of an internal evaluator to evaluate the programme. The Standards were applied to the statistical results of the experimental study. The questions to be addressed are:

What are the strengths and weaknesses of the programme?
What recommendations can be offered on the available evidence? (Sanders, 1994)

6.2.6.3 Applying the Standards

The Program Evaluation Standards are divided into four categories reflecting the four characteristics of sound programme evaluation: utility, feasibility, propriety and accuracy standards. After considering all evidence relating to each individual standard, the findings are summarised below.

The first standard used to evaluate this study is Utility Standards.

6.2.6.3.1 Utility Standards

The utility standards are intended to ensure that an evaluation will serve the information needs of intended users.

The Stakeholder Identification Standard (U1) was met as the merit of the programme was evaluated in the community's best interests. Stakeholders refer to those who should be involved or may be affected by a programme evaluation (Sanders, 1994).

The programme was discussed with the principals of the schools, and a lecturer in preschool education, to assist with the planning and implementation of the programme striving to accommodate their information needs. Parents were requested to consent to the study.

Children of different racial, cultural and language groups participated in the study enhancing ecological validity.

The evaluator had appropriate credentials for the evaluation assignment and was believed to be competent in being given permission to go ahead. The Evaluator Credibililty Standard (U2) was observed. The evaluation was also reviewed by an external programme evaluator (Sanders, 1994).

The scope of the evaluation appeared to address the main questions: Were needs met? Were participants, and their teachers and parents satisfied, and were the facilities and materials adequate?

The Information Scope and Selection Standard (U3) was respected as information collected was selected to answer pertinent questions about the programme and whether it responded to the needs of the stakeholders (Sanders, 1994).

The Values Identification Standard (U4) was met because the perspectives, procedures and rationale to interpret the findings were described so that the basis for judgment was clear (Sanders, 1994).

The evaluation report is clear (U5) and available for public scrutiny (U6). This contributes to the project's continued impact in terms of the development of appropriate programmes for preschoolers (Sanders, 1994).

6.2.6.3.2 Feasibility Standards

The feasibility standards will be evaluated in this section. They are intended to ensure that an evaluation will be realistic, prudent, diplomatic and frugal (Sanders, 1994).

The evaluation procedures were designed to be the most practical, to keep disruption to a minimum, while implementation and testing was completed. This standard (F1) was met. Stakeholders were consulted and convenience to them was given first priority. Verbal contractual agreements with the schools were concluded. Pre-planning in terms of data collection and interpretation was carried out.

The standard of Political Viability (F2) is not applicable as the programme received all stakeholders' support (Sanders, 1994).

The Cost Effectiveness Standard (F3) is upheld as the programme is cost-effective (Sanders, 1994).

Because outcomes of projects are often intangible and values are subjective, qualitative assessment may be more appropriate to assess whether all these criteria were met.

6.2.6.3.3 Propriety Standards

The propriety standards are intended to ensure that an evaluation will be conducted legally and ethically. These standards are examined in this section (Sanders, 1994).

The Service Orientation Standard (P1) was met as educational goals were appropriate, learner development was respected, and promised services were delivered contributing to accountability. The evaluation of the programme was used to identify all possible programme effects on learners (Sanders, 1994).

The standard of Formal Agreements (P2) was adhered to. Following detailed discussions with principals in providing dates for screen-testing and pre-testing, a roster of agreed upon dates and times for the 20 sessions of the programme and the post-testing at the schools was circulated. All parents signed consent forms. As promised, school readiness assessment reports were sent to all parents, and the teachers were given copies for the childrens' school files. A formal agreement was drawn up between the researcher and psychometrist regarding testing required and payment (Sanders, 1994).

Rights of Human Subjects (P3) was not an issue as there was no known threat to participants. The control group and groups from non-selected schools received the treatment after implementation of the experimental programme (Sanders, 1994).

Human Interactions (P4) were considered in being respectful to parents, teachers and the participants of the programme. Communication was fostered to encourage positive relationships (Sanders, 1994).

Complete and Fair Assessment (P5) was aimed for. Both positive and negative aspects of the programme needed to be reported. Outside expertise was sought to assist in the evaluation of the programme (Sanders, 1994).

Disclosure of Findings (P6) was a requirement of the study as all evaluation findings and limitations have been reported (Sanders, 1994).

The standard of Conflict of Interest (P7) is not an issue as the researcher was investigating the worth of a stimulation programme and was not biased in any particular direction regarding the programme's success or failure. An independent evaluator assessed the results of the programme so that this standard could be met (Sanders, 1994).

Fiscal responsibility (P8) was met as monetary costs were accounted for in terms of time, materials, expenditure: the payment for the psychometrist, the printing costs for worksheets, pencils, coloured pencils, crayons, scissors and puzzles. Petrol, reference and story books were excluded from the costing (Sanders, 1994).

6.2.6.3.4 Accuracy Standards

Accuracy standards will be discussed in this section. They are intended to ensure that an evaluation will reveal and convey information about the features that determine the merit of the programme (Sanders, 1994).

Programme Documentation (A1) was met in that the 20 sessions were outlined in detail.

Context Analysis (A2) was met in that the programme sites, staff and socio-economic groups were described. These contextual factors were considered during the interpretation of the data. No unusual circumstances that could affect children during the implementation of the data occurred (Sanders, 1994).

Described Purposes and Procedures Standards (A3) have been adhered to in that the objectives of the evaluation have been followed so that findings and actual implementation could be reported (Sanders, 1994).

Defensible Information Sources (A4) was met as all sources of information were described so that adequacy of the information could be assessed (Sanders, 1994).

Valid Information (A5) was complied with as standardised tests were used to gather information and contribute to validation of findings (Sanders, 1994).

The standard of Reliable Information (A6) was observed. Consistency of ratings was aimed for by the researcher (Sanders, 1994).

The Systematic Information (A7) standard stipulates that all information is accumulated in as free from error as is possible. This was strived for by the researcher (Sanders, 1994).

The Analysis of Quantitative Information (A8) standard requires that information is appropriately and systematically analysed so that the evaluation questions are answered (Sanders, 1994).

Analysis of Qualitative Information (A9): This standard could not be met as this study was a quantitative study (Sanders, 1994).

The standard of Justified Conclusions (A10) was addressed as the full range of relevant questions were examined with valid and reliable information (Sanders, 1994).

Impartial Reporting (A11) was met as the evaluator reported the findings without bias (Sanders, 1994).

The standard of Meta-evaluation (A12) was respected as the evaluation itself was examined (Sanders, 1994).

This section in which the study was evaluated according to the Program Evaluation Standards reached many of the same conclusions regarding the stimulation programme as in the previous section evaluating the programme from a programme evaluation perspective.

The following section discusses the limitations of the study.

6.3 LIMITATIONS OF THE STUDY

A limiting factor of this study was the lack of a pilot study. Many difficulties and problems might have been anticipated and corrected if this had been carried out (Murray & Lawrence, 2000).

The limitations of this study are discussed under the following headings: assignment of groups, research in education, research with children and the context in which the programme was implemented.

6.3.1 Assignment of groups

The heterogeneity of the groups became an issue which would prove to render the study a greater challenge than previously thought. It was not possible for a general programme of stimulation to remedy specific difficulties unique to each individual in a group situation. Challenges pertaining to the assignment of groups in this study are discussed below.

Although different children benefit from different teaching approaches, the programme was a group programme. Although this approach is suitable for all children, other additional approaches have been shown more beneficial in teaching certain children for example, those with attentional difficulties or second language learners. Salisbury and Smith (1993) endorse this by recommending that an individual child's learning needs require an individualised programme in which the specific child's difficulties are addressed. This group programme was not able to do this.

The original four schools where the screening tests were performed were viewed as homogeneous as the children came from middle class, suburban English language pre-primary schools. Schools were randomly assigned to represent an experimental and a control group. Similar schools were selected to control variables (Rubin & Babbie, 2001).

Barlow and Hersen (1984) caution against the generalisability of group outcome to individuals as individual outcomes are obscured in group averages. In group designs the variability between subjects may be responsible for weak effects where some clients show

improvement and others, deterioration. Mertens (1998) believes that if comparable treatment and control groups are not included in the study, it may be inappropriate to lump the groups together as an aggregation of dissimilar groups may obscure effects. Were the groups divided into sub-groups of second language, attention deficit disorder, gender, parent involvement, Mertens's (1998) belief may have been confirmed in that more positive effects may have become evident when similar sub-groups were compared.

As mentioned, there were unequal numbers with regard to gender, English first or second language, those who attended nursery school or not, and those identified with attentional difficulties or not. On the one hand, although comparison of these groups may have yielded interesting findings, the small and sometimes empty sub-groups may have limited the statistical power of the study, on the other. Ideally there should have been selection based on these criteria to enable larger cell sizes. This could also have been combined with a matching strategy for intervention and control groups. However, this would have produced participants in each school who belong to various intervention and control groups and would not have been suitable for a study of this time-frame.

Although a Pretest-Posttest Control Group design was selected, groups did differ on various non-controllable variables. Non-controllable variables such as teacher characteristics, teacher competencies, preschool curricula followed in the preschools, home languages and socio-economic variation between children and areas affect population validity and may have influenced findings.

In the present study purposive sampling was used as the study was aimed at children with delayed development. This caused a skewed sample to the right as means were below average. A degree of sampling error can be expected due to purposive sampling. Sampling bias eliminated the average and above average children from the sample and unbalanced the groups. This destabilised the statistical theory of the normal distribution curve. It may be suggested that the intervention may have had a better impact had the group been a more homogeneous group (McMillan, 2000). The statistical effects of this were minimised and ecological validity was ensured by using non-parametric statistical tests.

Related to the concept of a skewed distribution was the decision to use the children scoring below the 50^{th} percentile per school sample which introduced a restricted range by excluding the above average performing testees. The possible reasons for scoring low on a screening-test further complicate decisions about the research. Some of the children in the sample may have suffered delays due to environmental or inadequate educational stimulation. There might also have been other pathology or problems amongst the children in these groups which might not have been identified. Some of the children might have been included in the sample as it was the beginning of the year and they were unsure of themselves and at the time, unsettled and unstable in their new strange environments.

Both schools might have been influenced by the Hawthorne effect where teachers give special attention to the participants. This was followed up with the teachers afterwards and they reported that they always give more attention to children with difficulties and they were aware that the control group included the weakest children in the preschool group (Babbie & Mouton, 1998).

The necessity of written permission from parents can result in a biased sample. There were a few parents from each school whose children were originally selected but declined to give consent for their children to participate in the study (McMillan, 2000).

In educational research there is never a no-treatment group. There is always a traditional treatment occurring concurrently. The pre- and post-test measures on the intervention group (Group 1) form a baseline against which the effect of the intervention can be measured as compared with the control group. It is possible to say that the intervention programme caused the outcomes in this group, as the normal school curriculum was also presented to both groups of children concurrently.

6.3.2 Research in education

Previous research into varying aspects of education serves as motivation to continue testing educational theory and practice. In this section the intervention programme is discussed in relation to previous educational research.

Katz (1999b) has researched the merits of a constuctivist versus an instuctivist approach to learning. Snow, Burns and Griffin (1998) have shown that learning is enhanced when content learning is embedded in play. The question is asked if more positive results would have been forthcoming had the intervention programme been more constructivist in its approach. Although it was based on developmental theory, it was instructivist in its aim to stimulate the children cognitively. Comparative studies between these two approaches have yielded mixed results but the constructivist approach tends to show better long-term effects especially with boys (Katz, 1999b).

Related to the fact that this intervention programme was instructivist in its approach, Gallagher (1991) questions why psychologists attempt to prove the effectiveness of cognitive interventions which have proven to be the most stable and resistant to change as opposed to other factors which may prove to be more modifiable. He replies by mentioning that psychologists continue to investigate the cognitive domain perhaps because of the trust they have developed in their measuring instruments.

Initial results of research into compensatory educational programmes for preschoolers were originally thought to be disappointing, largely because initial assessments were looking for IQ gains. Sylva (1999) reviewed these studies and emphasised that the long-term benefits of preschool education are reflected in social and emotional outcomes and not only academic achievement. The outcomes are reflected in motivation, self-concept and social commitment, and not only formal scholastic skills. Non-intellectual functions such as organisisation, flexibility, planning, motivational and self-control, which were not measured in this study, may also influence the actualisation of potential (Barkley, 1997). Just as judgments should not be made on quantitative data alone, qualitative information should be considered in the interpretation of findings (Bracken, 1991b).

Another explanation cited by Adey, Robertson and Venville (2002) is that academic gains become apparent later in a child's schooling once these have been mediated by improving information-processing ability which, in turn, improves working memory.

Although positive evidence for intervention emanates from the field of neuropsychology, the current perspective of cognitive development is constructivist, of a systems or ecological approach. This study did not investigate the improvement of the children's abilities from the angle of the many proven contributing variables, for example parent involvement (Clarke & Clarke, 2003), or the adaptation of the school to the child (Meisels, 1999).

This suggests that a programme of this nature cannot only be evaluated from a quantitative perspective. Non-cognitive aspects are difficult to measure quantitatively. However, reliance on a qualitative framework to assess social and emotional outcomes in the short-term also limits one's analysis. Observation, teacher and parent interviews and questionnaires would need to be interpreted to evaluate these outcomes. Long-term follow up would be advisable to validate original findings. This proved beyond the scope of this study.

Although the principle exists that all children are entitled to intervention when required, a negative finding reported by OFSTED (Office for Standards in Education) in the UK in 1993 stated that underachievement is apparent at an early age and that many pupils never recover from early failure in basic skills. This goes against the grain of our current constructivist educational policy of OBE where children should be given every opportunity to succeed in the least restrictive environment (Mittler, 2000).

Underachievement is commented on by Fuchs et al. (2002) in which they labelled the children at risk who did not benefit from the intervention as non-responders. They put forward their observation that many interventions are tested on normal populations and that the at risk children are omitted from the studies. This study researched its programme on only children with delayed development. Fuchs et al. (2002) recommend that research identify the best practices and put these in place to help all children.

In the next section the factors influencing research with children are discussed.

6.3.3 Research with children

The Pretest-Posttest Control Group design is an experimental design which yields clear cause-effect relationships between an intervention and its outcomes. This section discusses research with children.

Samuels, Killip, Mackenzie and Fagan (1992) state that there are a number of difficulties in using standardised tests with preschool-aged children. Many standardised tests represent white, middle-class culture and afford little or no allowance for cultural differences. Culturally-different groups are under-represented in standardisation samples hampering interpretation. Tests may not measure the same underlying constructs for all children. Assessing normal development and identifying at risk children become more difficult when testing a child from a different culture (Barona, 1991). In this study the sample included multi-cultural and multi-lingual children. These aspects were not investigated.

Woodhead (1998) passes an interesting comment which has bearing on this research. He criticises Western scientific and pedagogical thought for offering a narrow vision on what

is right for childhood education, intervention and assessment. Even though he encourages sensitivity to cultural diversity, standardized tests remain culture and language based.

Cultural differences pose challenges for local assessment. That prudence and caution are valued in African societies above quickness would influence data from a cross-cultural perspective (Nell, 2000). The Griffiths Performance subscale which measures performance ability requiring accuracy and speed in solving puzzles is an example of a test which may be regarded as culturally-unfair to an English second language group. This factor may have influenced results.

Learning is influenced by culture and language. Individuals understand and recall information that is most relevant to their culture. Young children who are non-English speakers may develop learning problems if placed in a monolingual English class on school entry. Understanding and processing is affected and they may become inattentive and distractible. Differences in styles of interaction may affect learning. For instance, in some cultures it is considered impolite for eye contact to be maintained between a child and an adult. Not only are these children at risk for learning, they are also at a loss for knowing what behaviours are expected in their new, unfamiliar environments. Standards for testing may need to be adapted for example, the examiner may need to initiate conversation or have to encourage the child to respond (Barona, 1991; Bracken, 1991a). Although these guidelines were followed, results may have been influenced.

The preschool child's test behaviour may be specific to the evaluation and may or may not generalise to other test or non-test situations. Situational structure and interpersonal interactions are examples of possible environmental influences on the child's performance (Bracken, 1991b).

Assessing young children is difficult due to their limited language, attention and transient responsiveness (Samuels et al., 1992). Children from disadvantaged backgrounds pose greater difficulties for researchers. These children might be less attentive or do less well on certain tasks (Bracken, 1991b).

Related to the child's test behaviour are the characteristics of preschool children which can affect assessment. The child's spontaneity may be interpreted as unpredictable and unreliable. Preschool children follow their own impulses and do not understand the constraints of the testing situation. Inability versus unwillingness to answer is often difficult to discriminate between and leads to lowering of scores which may in turn lead to incorrect interpretation. Test performance may even be influenced by hunger or fatigue (Bracken, 1991b; Lidz, 1991).

6.3.4 Context in which the programme was implemented

The theoretical and situational context in which the programme was implemented influences the results of the study.

The constructivist perspective of cognitive development and the ecological theory (Bronfenbrenner, 1979) which is subscribed to in this study and on which contemporary educational policy is built was not considered sufficiently. Factors such as the characteristics of the child, the quality of the parenting and home environment, the

neighbourhood and society were not examined as potential variables in the study. These may have influenced the outcomes.

Situational characteristics and the specifics of the setting and context in which the study was conducted varied from group to group. The time of day may have affected the children's performance. It is a known fact that children respond better in the morning than later in the day (McMillan, 2000). For example, the one session took place in a classroom when all the other children in the nursery school were having break right outside. This group received another of their sessions early in the morning and the other at midday.

Another important contributing factor to fostering school readiness in children is a stable home environment which is an uncontrollable variable as it is difficult to measure. There were certain children known to both the teachers and the researcher where home circumstances were negative and would influence these children's development.

Even though feedback demonstrated a high incidence of client satisfaction, this cannot alone demonstrate that a programme is effective (Royse et al., 2001).

In conclusion, Lichtenstein and Ireton (1991) still believe that early identification and intervention is regarded as valuable in assisting at risk children.

Based on the limitations discussed in this section, the recommendations are mentioned in the next section.

6.4 RECOMMENDATIONS

As recommended by Louw (2000), a study of programme theory and programme evaluation and the use of a pilot study are endorsed before embarking on a study involving the testing of an intervention programme.

Further recommendations are:

Long-term research into the consequences on children with barriers to learning who do not and who do receive appropriate intervention needs to be carried out. The concept of delayed cognitive increments after termination of the intervention (Clarke & Clarke, 2003) may shed new light on so-called non-responders (Fuchs et al., 2002).

Long-term follow up of participants with continued intervention and without could be included in a study. This would confirm earlier results or expose reasons why gains are not sustained.

Possible samples could include for example younger children, children of different cultural groups, children with supportive parents and children diagnosed with attention-deficit disorder. Different groups of children may respond differently to an intervention.

Regarding this particular intervention, the duration of the programme should be extended to maximise its possible positive effects. The intervention programme must be implemented in the last term. The first part of the day should be the time to introduce new learning and the sample groups should be homogeneous.

A Solomon Three or Four Group design could be employed. A qualitative design could be used to examine other variables such as personality aspects of the children and success of the programme. A phenomenological study on how children respond to an intervention could be undertaken.

The positive outcomes of this study are:

- All the children with developmental delays who received the intervention programme showed a statistically significant improvement on the Personal-Social and Eye-Hand Co-ordination subscales of the Griffiths Scales and the Draw-a-Person. Personal-Social development. Visual-motor co-ordination, emotional and intellectual maturity are important aspects of school readiness.

- This is an important coup for intervention research and confirms its value in the domain of preschool education.

- Although this instructivist programme proved successful in improving the abilities of children with delayed development, the constructivist perspective in which the influence of an ecological or systems approach on the dynamic developing child, is also endorsed.

- This study proves that remediation in a group is successful. It is innovative and cost-effective in terms of manpower and time. It complements our OBE approach in education and enables all children with delayed development to receive help. In a country with limited resources it can provide preventative treatment before a learning difficulty arises when the child is enrolled in formal education.

- This study endorses the value of early intervention programmes which have been shown more successful in helping a child than later remedial assistance at primary or high school level (McCormick & Hickson, 1996).

- The biological, sociological and ecological perspectives with regard to gender development are supported by the results obtained in this study. The genders responded differently to the intervention programme. For the male children their language abilities, visual-motor co-ordination and emotional and intellectual maturity showed improvement. For the female children visual-motor co-ordination and emotional and intellectual maturity improved.

- The Griffiths Scales assessment reports helped to identify children with difficulties whom the teachers and parents could help prepare better for formal education.

- The intervention programme had a positive effect on the children as they enjoyed the activities. The intervention prepared the children for formal education as they learned to work with a different teacher and complete formal educational tasks independently.

6. 5 CONCLUSION

In the light of the large numbers of South African children who are at risk for grade one due to being disadvantaged, it is recommended that the educational authorities address the issue of children receiving little or no stimulation by mostly unqualified staff. It is recommended that all children receive a year of quality preschool education by qualified preschool teachers. Although we subscribe to a constructivist perspective to education in our country, our schools may not be adapting sufficiently to the needs of the learners (Cassidy et al., 2003).

Children with barriers to learning (disabilities or disadvantage) require a longer programme and appropriate intervention. Resources, for example, psychologists (especially educational), occupational and speech therapists, and physiotherapists, need to be made available to the wider community.

Finally, preschool programmes benefit all children in cognitive and non-cognitive ways, (especially children from disadvantaged backgrounds and those at risk for formal learning). Flowing from this are cost benefits to society from an economic, psychological and social perspective. This study endorses the belief that general preschool development is promoted by all kinds of educational stimulation within a recognised preschool programme.

APPENDIX A

CONSENT TO PARTICIPATE IN STUDY

I am interested in stimulating young children who display educational delays with a programme of intervention. The test I will be using is regarded as a school readiness assessment. If you would like your child to participate, you will receive all results on your child's testing. Testing will be done at your child's school as arranged with the Principal of the school. All testing is free of charge. By assessing your child, further learning on overcoming developmental delays will be obtained.

Your child's participation in this study is voluntary and you are free to withdraw him/her at any time. No real names will be quoted in the study to ensure confidentiality.

This project has been approved by Rand Afrikaans University and complies with ethical principles as laid down by the American Psychological Association.

If you would like any additional information, you are welcome to contact me at 678 8856.

If you would like your child to participate, please sign your name below.

Thank you.

Name of your child ……..

Signature of parent/guardian …… Date……

APPENDIX B

PROGRAMME OF INTERVENTION

Session 1 Me and my Body

The theme is introduced by telling the children they are special. The ways in which they are the same for example, bodies and feelings, and the things that make them different, for example, appearances and names, are discussed. Each child is given an opportunity to name a different part of the body. Other parts are pointed out to children to name who name a part that has been mentioned or who cannot think of a part. Finally, parts such as wrist, ankle, heel, ear lobe, palm, eyebrow, eyelash, names of fingers (thumb, index, middle, ring and little or "pinkie") are introduced.

The functions of parts are questioned by asking, "Eyes …..?" encouraging the children to respond, "see". The researcher continues with ears hear, mouths talk, tongues taste, hands touch, fingers feel, arms move, legs run encouraging all other descriptive verbs.

Music is introduced using a tape recorder and songs contributing to body image for example, Head and Shoulders Knees and Toes, Hokey Pokey and 12345 Once I caught a fish alive are sung. The action songs assist gross-motor co-ordination and sequencing.

Rote counting to 10 is introduced. Most children can count to 20 at this stage but few understand the concept of one to one correspondence. Children are asked to count their fingers, and toes.

The worksheets are shown and instructions given. The little girl and the clown are compared to add to body image awareness. The children are asked how the two differ and shown how to circle the parts that make the clown different from the girl for example hat, hair, eyes, nose, mouth, hands, clothes, legs and feet. The children are shown how to join the dots from 1 to 10. The second worksheet is explained pointing out the numbers, encouraging the children to count the dots and the body parts and to trace and try and copy the numbers. The children are then asked to sit at their tables and proceed with their work.

The researcher checks each child's progress, helps where required and praises their efforts on walking around. Children who can write their names are encouraged to do so.

Session 2 My family

The theme is introduced by giving the children a chance to talk about their families. The researcher adds that families are all different, some have Mums and Dads, some have only one or the other, some live with grandparents, some may have many children and others may only have one child.

The researcher reads a book about opposites entitled Knowing by Brimax Books, drawing attention to the meaning of the word, opposite. The following opposites are described and illustrated in the book: hot cold, heavy light, big small, square round, day night, and light

dark. Vocabulary is stimulated by introducing more opposites: tall short, old young, thin fat, girl boy, sister brother, child adult, son daughter, man woman, father mother, husband wife, granny grandpa, black white, up down, left right, top bottom, inside outside, front back, fast slow, smooth rough, loud quiet, and noisy silent.

How to do the worksheet is demonstrated. The children are shown how to draw lines from each picture to its opposite: child adult or small big, dark hair (brunette) blonde hair, fat thin, mother father or woman man, baby grandparent or young old, and short tall.

The second worksheet dealing with visual discrimination (position-in-space) is explained. The children are required to circle the number in the row that looks exactly the same as the one in the margin.

Clapping to the rhythm of We've got the Whole World and following the actions of Hokey Pokey and 12345 Once I Caught a Fish Alive conclude the session.

Session 3 Growing

Germinating bean plants are shown to the children to interest them in the topic of growing. They are asked to contribute their thoughts on growing. The researcher tells them about the importance of healthy food, sleep and exercise and encourages them to share their ideas on healthy food. The bean plants are taken to school every second session for the children to observe their growth.

A book The Very Hungry Caterpillar by Eric Carle is read.

Movement exercises follow. The children are asked to crawl like a worm, fly like a butterfly, and grow like a bean.

How to do the first worksheet is shown. Ask the children the name of the shape. Most remember that it is a circle. The children are asked to trace the circles to stimulate fine-motor co-ordination.

In the second worksheet they are to colour-in only the healthy food. The alphabet is represented in the different types of food and the worksheet may be used for this purpose at a later stage (apple, banana, cake, doughnut, egg, fish, grapes, hamburger, ice cream, juice, kidneys, lettuce, milk, noodles, orange, potato, quince, radish, sweets, tomato, utensil (fork), vegetables, water, Oxo, yoghurt, zest). It was too early in the year to use the worksheet in this way.

Session 4 My Home

Focus on homes. Most people live in homes. People who don't have homes are called homeless people. We have an address which is the place where we live. The school has an address. Explain the number of the house in a particular street in a particular suburb. Most children do not understand this concept or know their address at this stage. Some know their telephone numbers so this was included in the discussion.

A bag of different objects producing different sounds is brought and the children are invited to guess the sound to stimulate auditory perception (keys, bottle with liquid contents to shake, bell, child's rattle, spoon to stir in a cup, paper to crumple, plastic packet to crush, cosmetic spray). The children are praised for their careful listening.
Recapitulate on counting to 10, increase to 20, and teach the days of the week.

The first worksheet deals with sequencing where the children are required to number the pictures in each row from 1 to 4 in the right order. All the examples are explained so that the children understand that events follow in a particular order. The words first, second, third, fourth or last are used. The children are asked what happens first, what happens next, what happens after that and what happens last to re-inforce the order of events. The first set of pictures deals with a germinating bean plant (they have seen a germinating bean in session 3). The second shows the construction of a home (the theme of this session). The third row shows the progression of age (linked to session 2 and the teaching of the opposites young and old). The last set of pictures shows getting up in the morning which all children can relate to.

The second worksheet deals with visual-motor co-ordination. The children are asked to draw straight lines to improve their fine-motor control. The direction in which the line is drawn is verbalised as straight across, down, or up.

Session 5 Moving

A general discussion on moving house is held. Relevant vocabulary for example, relocate, pantechnican is introduced. A story about a homeless mouse who finds a new home entitled A house for Lily Mouse by Michelle Cartlidge is read.

The children are requested to trace the routes the removal vans must take through the mazes to reach the new homes in the first worksheet. This exercise is to encourage planning.

The second worksheet involves paper-folding to assist fine-motor co-ordination. The children are taken through the various steps to make a box. The instructions to follow and lines along which to fold are printed on the worksheet.

Session 6 Holidays

Counting to 20 and the days of the week are recapped.

Holidays as the subject of discussion is introduced. The significance of public holidays like Youth Day and Christmas Day is taught. Longer holidays like school holidays and holidays away at the coast or visiting family and friends are talked about. The sea as a holiday destination is shared in discussion as this is featured in the first worksheet.

A movement game is played. Children have to pretend to be as stiff as a board, limp like a rag doll, sway like trees in the wind, jump like frogs, parade like horses, hop like rabbits and row boats.

The first worksheet requires the children to circle 10 differences between the two pictures. They are taught how to scan the pictures from left to right and top to bottom comparing the two pictures to find the differences.

A book on shapes is read to the children (Shapes published by Brown Watson). The children are encouraged to name the shapes of their own accord. The second worksheet requires the children to draw a line from the shape at the top of the page to a toy with a matching shape below.

Session 7 Animals

The children are encouraged to say nursery rhymes which involve animals for example Mary had a Little Lamb, Pussy Cat, Three Little Kittens, Goosey Goosey Gander, To Market, I had a Little Pony. The children are taught what a rhyming word is and are encouraged to fill in the rhymes of the nursery rhymes. Rhymes are important in developing children's auditory perception.

A book of animals is brought and the photographs of animals shown and named to the children. In the first worksheet the children are asked to cross out the animal that does not rhyme with the other two. The children are asked to say the names of the animals to listen out for the one that does not rhyme:

Cat bat snake, dog frog chicken, bug slug fish, cow sow rabbit, lamb ram lion, moose, goose elephant, eagle beagle owl, bear, mare butterfly, buck duck tortoise, fox ox bird, whale quail octopus.

The children play a movement game. They are asked to imitate a cat, walk like a dog, swim like a fish, slither like a snake, jump like a frog, fly like a bird, waddle like a duck, move like a tortoise, gallop like a horse, and graze like a cow.

The letters on the worksheet are shown to the children and the alphabet is explained. They were told that all words consist of letters and these 26 letters are what we use when we read and write. Letters are written in upper and lower case. All letters have names as the children all have names and they all have their own sound. The alphabet is sung. The children are asked to copy all the letters of the alphabet in the second worksheet.

Session 8 Pets

Children are asked to share about their pets. The researcher adds to the discussion regarding the kind of animals people keep as pets (dogs, cats, budgies, parrots, mice, guinea pigs, fish, and rabbits), and how to care for different pets.

The Cat in the Hat by Dr Seuss is read and the rhyming words are pointed out.

The first worksheet is shown to the children. Names of animals that begin with the first four letters of the alphabet (a, b, c and d) are indicated. Upper and lower case is indicated. The names and sounds of the letters are taught. The children are asked to match the animals on the left to their rhyming words on the right by drawing lines: asp-wasp, ant-

pant, ape-cape, bat-mat, bird-word, bunny-honey, cat-rat, cow-sow, crow-bow, dog-log, duck-luck and deer-ear.

The second worksheet entails counting the pets in the left column, drawing the same number of dots in the second column, tracing the numbers in the next two columns and copying the number in the last column. The children are then requested to complete the worksheets.

Session 9 Shapes

The names of all the shapes are recapped in this session. The words are broken down into their syllables and each syllable is clapped to: cir-cle, square, rec-tan-gle, tri-an-gle, o-val, heart, cross, dia-mond, and star. This is to stimulate auditory perception.

The first worksheet requires the children to trace and copy the shapes.

A paper-folding and cutting out exercise to stimulate fine-motor co-ordination concludes the session. Before the scissors are handed out, the rules are explained. Scissors are dangerous. Children may only cut out while seated. No waving about of scissors. The children are shown step-by-step how to fold the paper as shown on the second worksheet and shown how to cut out notches.

Session 10 Insects and Spiders

Insy, Winsy Spider is sung with the actions and Little Miss Muffet is said for the children.

Books on spiders and insects are brought and pictures shown inviting discussion from the class. The children are told that most spiders are harmless but that some are dangerous. They should call an adult if they are worried about a particular spider. They are shown pictures of insects and told about ants, bees, flies, dragon flies, lice, fleas and beetles.

The children are asked to say the insect rhyming words out aloud of the first worksheet: bug-slug, snail-rail, fly-eye, roach-coach, worm-germ, fly-pie, ant-pant, spider-rider, flea-key, cocoon-racoon, moth-broth, gnat-bat and lice-mice.

The letters e, f, g, h and i are shown to the children. The letters on the worksheet are lower case and their respective names and sounds are taught. They are required to find all the e, f, g, h and i's in the picture of the second worksheet. The aim of this exercise is to re-inforce what these letters look like and stimulate visual-perceptual skills (figure-ground).

Nine, 12 and 24 piece puzzles are swopped around the class. Children who battle are assisted in how to go about doing a puzzle. First the four corner pieces are found. The position they need to be placed in is checked by matching the pieces on the picture of the puzzle. Then the straight-edged pieces for the sides are filled in by checking where they fit on the picture of the puzzle. Then the remaining pieces are examined for detail and matched on the picture for placement.

Session 11 Safety

The first worksheet is shown to the children and they are asked to identify all the potential dangers: kettle on edge of kitchen cupboard, electrical cord hanging over side of cupboard, stove, electrical cord of the lamp, electrical plug under table, spill on table dripping on to the floor, and ladder outside. The children are shown the letters j, k and l. These are named and their sounds taught. Many of the above dangers start with one of these letters: j: jug, juice, k: kettle, kitchen and l: ladder, and lamp. The instruction is to circle all the potential hazards that start with j, k and l in the picture.

Auditory perception is stimulated in the second exercise. The children identify the beginning sound, break the word into syllables and clap to the syllables of the following words: ha-zard, dan-ge-rous, care-ful, safe-ty, fi-re, e-lec-tri-ci-ty, stove and mat-ches.

The children are organised into two lines so that they can throw bean bags to each other. Instruction are given before the bean bags are handed out. They are to first start throwing bean bags to each other then to take a small step backwards and continue throwing until asked to take another step backwards. This is to improve eye movements and gross-motor skills.

Session 12 Hospital

The theme of going to hospital is introduced by inviting the children to share their experiences of when they went to hospital.

The first worksheet is shown to the children explaining relevant vocabulary (x-ray, oxygen cylinder, doctor's stethoscope, nurse's cap, patient). They are asked to cut out the pictures on the left-hand side and paste them into their correct positions on the picture. This cut out and paste exercise is designed to improve visual perceptual skills (figure ground) and fine-motor co-ordination.

The names and sounds of m, n and o are introduced in the second part of the session. To improve auditory discrimination words are read to the children and they are asked to select the odd one out, the one word out of three that does not start with the same letter as the other two words: mumps-malaria-nurse, medical-medicine-recover, nasty-nausea-hospital, nose-nostril-x-ray machine, organ-operation-stitches, oxygen-ointment-tonsils. The children are then asked to break the word up into its initial sound and rest of the word for example m-umps, m-alaria, n-urse.

A story entitled Going into Hospital by Althea Braithwaite is read to conclude the session.

Session 13 Sense Organs and Shopping

The first theme is introduced by showing the children the letters p, q and r. Their names and sounds are taught. The pictures on the left-hand side of the work sheet are named: pear, puppy, plant, pig, queen, quilt, quince, quoit, radio, ring, rose and rain. Then the children are asked to point out their sense organs: eyes, nose, ear and tongue and their functions are explained. The children are required to draw a line from the picture on the left to one or more of the sense organs on the right to indicate how the picture is

experienced by the body. For example, a pear is seen and tasted so a line is drawn from the pear to the eye and the tongue and so on.

A collection of household packaging is brought and the children are asked to say what the packaging contains. This exercise is to stimulate the pre-reading skills of “reading” logos, labels and signs.

The second worksheet is done orally with explanation. The children are asked to circle the one that costs more money on each line.

Session 14 Transport

The session is initiated by asking the children what transport is. A short discussion takes place. The concept is explained by showing the children pictures of the history of transport from a children’s encyclopaedia.

The song The Wheels on the Bus is sung.

The first worksheet is shown to the children and the instruction given. They are asked to circle 12 mistakes in the picture. The children are taught how to visually scan to look for the discrepancies (man on the control tower, helicopter with no pilot in the front and rays instead of rotor blades, aeroplane with a “bird” pilot, a steering wheel instead of a joy stick, a bird’s wing and the pilot’s scarf flying in the wrong direction, a traffic light on the tarmac, an aeroplane with square wheels and no windows in the front, a dog on the tarmac and a man pushing a huge container on to a trailer). This exercise improves visual discrimination.

The second part of the session entails the folding of an aeroplane as drawn and explained on the second worksheet. The aim of paper-folding is to stimulate fine-motor co-ordination.

Counting to 20 is re-iterated.

Session 15 Work

The session starts by asking the children what work (occupation) their parents do and encouraging them to find out if they do not know. The children are shown the first worksheet and the occupations represented are named and described to them. The objects on the right-hand side are explained and the children are asked to draw lines matching the occupations to the objects on the right. For instance, the TV monitor, key pad and telephone answering machine are objects used by a secretary.

The letters s, t and u are introduced by teaching the letters’ names and sounds. The second worksheet requires the children to trace and copy the letters. Visual closure skills are also stimulated in this fine-motor co-ordination worksheet.

Before the tennis balls are handed out, the instructions are given. The researcher shows the children how to throw the ball into the air about 60 cms and catch it; to bounce the ball on the ground and to throw the ball to each other in pairs. Children with difficulties are

observed and given easier tasks to perform for example lower throws to catch, shorter bounces while on their knees and rollling the ball to each other.

Session 16 The Weather and the Seasons

A book illustrating the seasons and weather conditions is shown to the children (Playtime Learning by Dean Publishers). They are asked which season it is now and a discussion follows on the other seasons and weather conditions (sunny, partly cloudy, cloudy, thunder storms, hail, rain, snow, wind, and gale force).

V, w, x, y and z are introduced to the children. They are required to join the dots in the first worksheet to stimulate fine-motor co-ordination and directionality.

Attention is drawn to these sounds at the ends of words. The children are asked to say words aloud and listen to their end sounds: stove-pave-drive, tow-chew-jaw, axe-box-mix, toy-say-dry, and froze-buzz-maze. Auditory perception is stimulated by teaching awareness of sounds.
The session concludes by showing the children how to make a snowflake. Scissor rules are explained before the scissors are handed out (see Session 9). The instructions on the second worksheet are followed step by step. Assistance is given to children who need extra help.

Session 17 Our Country

Our flag is shown to the children and our national anthem is played for them.

The first worksheet requires the children to copy the upper case letters from A to Z down the left-hand side of the work sheet. Secondly, they are asked to copy the lower case letters on the right-hand side. Then they are asked to draw lines matching the upper to the lower case letters.

The second part of the session aims to improve auditory perception. The children are asked to generate another rhyming word: land, rand, -, sea, free, -, shop, crop, -, gold, bold, -, rain, grain, -, and road, load, -. They are then asked to identify the odd one out from the rhyming words: home-roam-country, storm-warm-plants, city-pity-town, work-perk-play, dam-ram-water, zoo-moo-animal. Then the children are asked what rhymes with sun but starts with f- (fun), rhymes with rain but starts with g-, (gain), rhymes with map but starts with t- (tap), rhymes with mountain but starts with f- (fountain), and rhymes with beach but starts with r- (reach). Awareness of beginning and end sounds of the following words is focussed on: house, garden, veld, town and farm. Awareness of middle sounds of the following words is focussed on: flag, stone, hill, sun, jet and bus.

Counting to 20 is practised.

Ant and Bee and the ABC by Angela Banner is read to the children to reinforce learning the alphabet.

Session 18 Our World

The session begins with a discussion on looking after our world and the concept of pollution. The first worksheet is shown and discussed with the children. They are then asked to mark the pictures with a tick or cross to denote whether what is shown in the picture is good or bad for our world.

The second worksheet draws attention to the sounds within words. Auditory perception is stimulated by asking the children to colour the pictures on the top half of the page with an ‘a’ sound in them and the pictures on the bottom half of the page with an ‘o’ sound in them.
Tennis ball play to stimulate eye movements and hand-eye co-ordination follows. Children are asked to throw the ball in the air and catch it, bounce the ball and throw it to each other.

Counting to 20 is practised.

Around the World with Ant and Bee by Angela Banner is read to the children to conclude the session.

Session 19 Space

The theme on space is introduced by showing pictures and describing scenes from a book entitled The Universe published by Treasure Press. The children are taught to count backwards from 10 to zero as with the countdown before rockets are launched.

The first worksheet is designed to improve position-in-space visual perception. The children are shown how to discriminate the matching picture from a number of slightly different but similar pictures on the right-hand side to the one on the left-hand side.

The second worksheet draws attention to the sounds within words. Auditory perception is stimulated by asking the children to cross out the pictures without and ‘e’ sound on the top of the page, and the pictures without an ‘i’ in the middle, and the pictures without an ‘u’ sound at the bottom of the page.

Nine, 12, 24 and 36 piece puzzles are swopped around the class. Children who battle are assisted in how to go about doing a puzzle. First the four corner pieces are found. The position they need to be placed in is checked by matching the pieces on the picture of the puzzle. Then the straight-edged pieces for the sides are filled in by checking where they fit on the picture of the puzzle. Then the remaining pieces are examined for detail and matched on the picture for placement.

Session 20 Going to Grade 1

A discussion on going to Grade 1 starts the last session.

The front page of the workbook can be coloured in for a fine-motor co-ordination exercise.

Auditory perception is stimulated by working through the following exercises:

The children are asked to identify one syllable from a two-syllable compound word:

Say blackboard - Now say it again but don't say black -board
Say tuckshop - Now say it again but don't say tuck -shop
say homework - Now say it again but don't say home -work
Say schoolbag - Now say it again but don't say bag -school
Say worksheet - Now say it again but don't say sheet -work
Say classroom - Now say it again but don't say room -class

The children are asked to identify and delete one syllable from a three-syllable word:

Say assembly - Now say it again but don't say as -sembly
Say uniform - Now say it again but don't say u -niform
Say remember - Now say it again but don't say re -member
Say headmaster - Now say it again but don't say master -head
Say library - Now say it again but don't say -ry -libra
Say athletics - Now say it again but don't say -tics -athle

The children are asked to identify and delete a beginning consonant sound in words where that sound is followed by a vowel:

Say ball -Now say it again but don't say 'b' -all
Say pen -Now say it again but don't say 'p' -en
Say sock -Now say it again but don't say 's' -ock
Say run -Now say it again but don't say 'r' -un
Say play -Now say it again but don't say 'p' -lay
Say work -Now say it again but don't say 'w' –ork

A book entitled Starting School by Althea Braithwaite published by Dinosaur Publications concludes the programme.

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